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ABSTRACT

This study investigated the extent to which teachers teach more effectively as a result of practice. Each of 12 experienced teachers taught a three-lesson social studies unit to three successive classes of eight junior high school students. The classes were taught on different days during one week. At the end of the unit each student completed a multiple-choice recall test, an essay test, and an attitude inventory that measured attitudes toward self and situation. Adjusted class means were calculated from the student tests. For the recall test, scores were stable from day 1 (the first class) to day 2 and then decreased significantly on day 3. Both sets of essay test scores were stable across teacher and day. Attitude-toward-the-situation scores increased from day 1 to day 2 and decreased from day 2 to day 3. Attitude-toward-self scores did not change significantly. Twenty teaching-process variables were measured and correlated with student posttest variables. These processes included teacher talk, teacher feedback, subject-matter focus, activity structuring, goal setting, and summarizing. Teaching processes did not vary significantly with practice, and few teachers showed increases in student learning with practice. If teaching tends to become less effective across practice on the same unit, conventional skill training may not be the remedy, Perhaps training can be devised to focus on eliminating ineffective teacher behavior that appears with practice. (Author/CD)

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STANFORD CENTER
FOR RESEARCH AND DEVELOPMENT
IN TEACHING

Technical Report No. 47

THE EFFECTS OF TEACHER PRACTICE ON STUDENT LEARNING AND ATTITUDES IN SMALL GROUP INSTRUCTION

Christopher Michael Clark

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Stanford, California

February 1976

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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INTRODUCTORY STATEMENT

The mission of SCRDT is to improve teaching in American schools. Its work is carried out through three research and development programs--Teaching Effectiveness, The Environment for Teaching, and Teaching and Linguistic Pluralism--and a technical assistance program, the Stanford Urban/Rural Leadership Training Institute. A program of Exploratory and Related Studies includes smaller studies that are not in the major programs. The ERIC Clearinghouse on Information Resources is also a part of the Center.

This report, which reproduces the author's doctoral dissertation (Stanford University, 1975), is based on research carried out in the Program on Teaching Effectiveness.

ACKNOWLEDGMENTS

Much of what I learned from this research came from my private decision making and reflection on the design of the study and the interpretation of the results. But a large share of credit for what I learned belongs to many advisors, colleagues, and friends.

I owe a particular debt of gratitude to Dr. Richard E. Snow, who was involved in this research, and indeed my entire graduate program at Stanford, from beginning to end. His insight, support, and direction saved me from the innumerable pitfalls present in research of this kind. Dr. Bruce R. Joyce was especially generous with his time, enthusiasm, and creativity during the final design and data collection stages of my research. A series of experimental studies carried out during his tenure as Acting Director of SCRDT's Program on Teaching Effectiveness provided the framework for the study. In addition, the curriculum materials used were developed and provided by Dr. Joyce and Elizabeth R. Joyce. Dr. N. L. Gage carefully reviewed, discussed, and challenged my interpretation of the results of my research.

Invaluable help came from many other individuals and in many forms. I must particularly single out Penelope L. Peterson, who provided me with intellectual and personal support during this study from its earliest conception to its ultimate fruition. I also want to thank Ronald W. Marx, Nicholas G. Stayrook, Janet L. Crist, Cynthia Joyce, Jane Anton, David Rubin, Margaret M. Bierly, Sia Wesson, George Stanton, Penney Jordan, Ann Gladstone, Jean Ziebron, and Patricia Jones for their personal support and varied contributions. Thank you also to the 12 participating teachers and the 312 participating students for their time and patience.

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CHAPTER I

THE PROBLEM AND PURPOSE OF THE STUDY

To what extent is training really necessary for teachers? Beginning teachers frequently criticize their professional preparation as largely irrelevant to their needs in the classroom. Veteran teachers often feel that experience was their best teacher--that the best preparation for teaching is teaching itself. Teachers at the middle school, secondary, and college levels who teach multiple sections of the same course often report that their second or third time through a lesson seems more effective than the first. In this connection, Medley argued that,

> . . . the effective teacher will differ from the ineffective teacher primarily in his control over the repertory of competencies he commands; in his ability to adapt his behavior to the pupils, the purpose, and the situation in which he operates; and most important of all in his ability to learn from his own experience. . . . (Medley, 1970).

The process of learning from experience has also been investigated in the psychological laboratory. In 1949, Harlow published a paper entitled "The Formation of Learning Sets." It was shown that monkeys and children improved with practice across a series of similar learning problems. That is, they "learned how to learn" a particular class of tasks. Learning-to-learn, or, more accurately, learning to problem solve, became an important concept in learning research (see, e.g., Harlow, 1959; Reese, 1964). The present study sought to determine if teachers learned-to-teach, using a paradigm similar to that of the Harlow studies. The basic question was: Do teacher effects on student learning improve as teachers gain experience in a particular teaching situation? That is, do teachers teach more effectively (as measured by amount and kinds of student

learning) the second or third time they teach a given curriculum unit than they did the first time they taught that unit?

A secondary purpose of this study was to create and test a laboratory system for research on teaching effectiveness. The design, with its attendant instrumentation, serves as a working example of a standard laboratory format within which any number of teacher process variables of interest might be investigated under controlled conditions.

Definition of the Problem

Much of the recent research on teaching effectiveness deals with relatively narrowly defined aspects of teacher behavior. Hundreds of sets of training materials or teacher training products have been developed over the past ten years to teach particular skills to teachers in the hope that this skill or that will provide an important part of what is needed by teachers to improve their effectiveness (Stanford Program on Teaching Effectiveness, 1974). Joyce criticized this approach by saying "It is very rare that any one skill . . . or any stylistic characteristic will stand out as the cause of learning. Even when we find that increased learning is associated with the presence of a certain kind of skill or style in teaching, it is very likely that the reason is because that skill or aspect of style is an index of a much larger complex of behaviors that signals the presence of a certain kind of environment" (Joyce, 1975, p. 62).

In addition to narrowness of focus, designs for research on teaching frequently imply that "effectiveness" is a relatively stable trait or teacher characteristic. In the present study, teacher effectiveness is

conceptualized as a developmental process in which teachers learn from their experience how to help students achieve cognitive and affective objectives more completely and efficiently.

Understanding the extent to which teachers can and do improve their effectiveness through experience alone has important implications for the design of both preservice and inservice teacher training programs. In the case of preservice training, the timing and nature of the practicum or practice teaching experience might be modified to provide opportunities for student teachers to learn how to learn from experience. Inservice training might concentrate more on the process of gradually increasing competence rather than on the accumulation of additional units of credit on a transcript.

As the dynamics of change in teaching effectiveness become better understood, teachers could become researchers of their own teaching, observing the effects of their behavior in their particular situations and with the particular students in their charge. This situation-specific, "bootstrap" approach to improving teaching effectiveness is consistent with Cronbach's (1975) position that broad generalizations or scientific laws (e.g., a list of competencies of the effective teacher) are not likely to be established by social science research. The interaction of innumerable factors defines each teaching situation so uniquely that only the teacher who is a part of the situation can validly cope with improving it.

Repeated practice may be insufficient for improving teaching effectiveness. But it seems to be a logical place to begin an inquiry into how teachers can help themselves become better teachers.

Purposes of the Study

The study addressed three major questions:

1. In what ways do students' cognitive achievements and attitudes vary as a function of teacher practice?
2. In what ways do teaching processes vary as a function of teacher practice?
3. What are the relationships between teaching process and the subsequent cognitive achievement and attitudes of students?

The general hypothesis of the study is represented in Figure 1. Teachers teach a short curriculum unit over 3 trials. Different students are taught in each trial. The predicted effect of teacher practice is that students taught on the later trials learn more and express more favorable attitudes than students taught on the first trial.

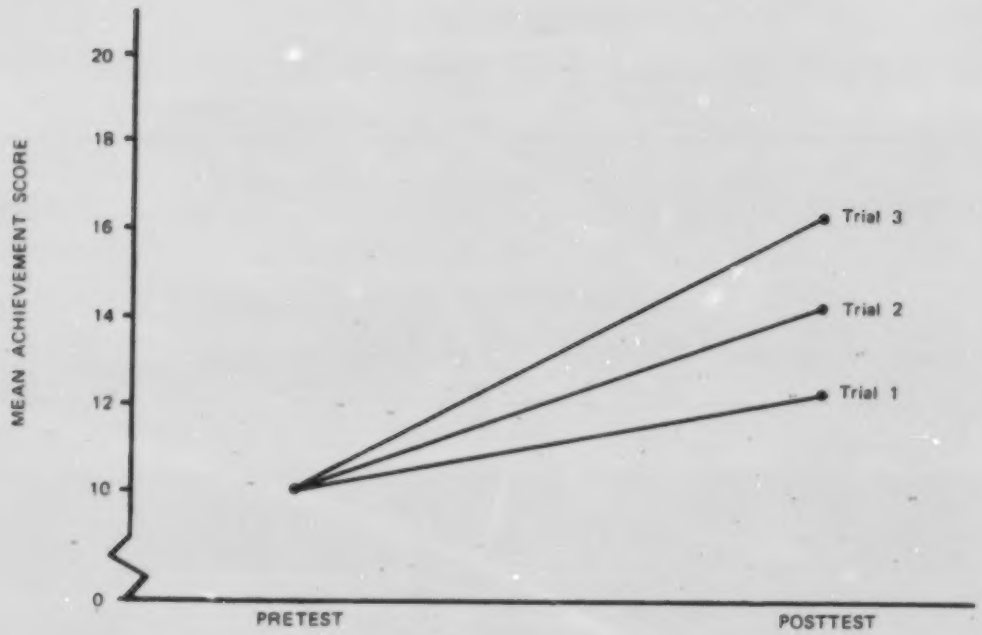


Fig 1. Predicted pattern of change in student learning as a function of teacher practice over three trials.

CHAPTER II

RELEVANT RESEARCH

This study relates to three areas of prior research: (1) investigation of learning-to-learn (Harlow, 1949, 1959), (2) studies of the relationship between teacher experience and teaching effectiveness (Fattu, 1962; Hall, 1964), and (3) investigations of the relationship between teacher behavior and student achievement (Rosenshine, 1971; Dunkin & Biddle, 1974).

Learning to Learn

In a series of studies by Harlow (1949, 1959) a concept called "learning-to-learn" was developed and refined. Harlow defined learning-to-learn as a developmental process in which a subject's method of problem solving changes from trial and error adaptation to a changing environment (novice) to adaptation by hypothesis and insight (expert) as the problem solver gained experience at working a particular class of tasks. Harlow believed that "the behavior of the human being is not to be understood in terms of the results of single learning situations but rather in terms of the changes which are effected through multiple, though comparable, learning problems" (Harlow, 1949, p. 51). The present study applied the concept of learning-to-learn to the performance of teachers; hence it was an investigation of learning-to-teach.

Three features of Harlow's work are particularly salient. First, Harlow used discrimination tasks in his investigations of learning in rhesus monkeys. The design of this study presented the teacher with a kind of discrimination task: to discriminate between teaching techniques

which achieve teaching objectives and those techniques which do not achieve the objectives. The teachers did not receive explicit feedback about the degree to which their students achieved the learning objectives, but it was considered possible that experienced teachers would derive sufficient information from interacting with the students to know whether or not the students were achieving the objectives. Second, Harlow used multiple trials in problem solving to observe changes in problem-solving ability. The present study uses three comparable trials of the complex task of teaching a social studies unit to a group of children. The dynamics of growth in teaching skill is the phenomenon of interest. Third, Harlow's construct of "learning-to-learn" is the basis for the prediction that the teachers in the study will progressively increase in effectiveness with practice in the experimental situation (i.e., "learning-to-teach"). Harlow's comments concerning the formation of "social-emotional learning sets" are particularly relevant here:

> Each contact the monkey has with a human being represents a single specific learning trial. Each person represents a separate learning problem. Learning to react favorably to one person is followed by learning favorable reactions more rapidly to the next person to whom the monkey is socially introduced (Harlow, 1949, p. 64).

In the present study, each group of students to be taught represents a new learning problem for the teacher.

Two investigations of the learning-to-teach phenomenon preceded the present study (Clark, Snow, & Shavelson, 1975). In the first study, four teachers tutored junior high school students, one at a time, in Newtonian physics. Each tutor taught one student for five one-hour sessions, and

then was assigned randomly to a new student the following week to repeat the material. Each tutor taught four students successively. Thus, 16 students participated.

An achievement test was administered to each student before and after instruction. Results indicated that, on the average, teachers did seem to obtain higher achievement from their students in each successive week. But the effect was weak, and was marred by one student's unusually high pretest score. The results were considered encouraging enough to attempt a larger experiment.

The second study was similar in design to the first. Here, however, 17 participating tutors were volunteer undergraduates, and nine of these tutors received a 12-hour training program in tutoring skills before teaching. The tutor training consisted of exercises in questioning, listening, and explaining in a tutorial context (see Clark, 1972).

Again, junior high school students (N = 68) were randomly assigned one at a time to a tutor for one week's physics instruction. This continued for four weeks. Achievement and attitude measures were administered before and after instruction. Because laboratory space was not available, tutors had to meet their students outside of school, in homes, parks, etc. An attempt was made to record all tutoring sessions on audiotape for analysis of teaching process variables.

The results of the second study were discouraging. While some tutors showed improvement with practice on some student outcome measures, performance curves were erratic and there was no apparent average improvement. In fact, analyses of variance and covariance showed that, on the average, control tutors obtained higher achievement from their students than did

trained tutors. There was some indication that this result was due to the trained tutors spending more time on skill practice, and less on instruction, than the control tutors. But this possibility could not be verified owing to the poor quality of the audiotapes. It was also noted that the tutoring situation allowed variation in interaction patterns so wide as to smother other effects of interest. In addition, students had uncontrolled access to the physics text material so that the effects of tutoring and the effects of studying were confounded. The design of the present study was superior to that of the second tutoring study in that identical laboratory teaching rooms were used by all teachers, student exposure to text material was controlled, and high quality video recordings were made of each teaching session.

Teaching Experience and Teaching Effectiveness

The relationship between teacher experience and teaching effectiveness has been explored in a number of correlational studies. Both teacher experience and teaching effectiveness have been defined in various ways in these studies, making it difficult to draw a general conclusion. When permanently certified teachers were contrasted with provisionally certified teachers (LuPone, 1961; Hall, 1964; Beery, 1962; Collins, 1964), the permanently certified teachers were generally more effective as measured by supervisors' ratings and pupil achievement scores. But when "older" teachers were compared to "younger" teachers, the older group tended to be less effective (Ryans, 1960a). In their reviews of the literature on predictive criteria and teacher effectiveness, Fattu (1962) and Howsam (1960) both concluded that this research had failed to confirm links between teacher experience and teaching effectiveness. Ryans (1960) stated that

"age of the teacher and amount of teaching experience seem to manifest an over-all negative relationship with teaching effectiveness, although there is evidence of curvilinearity, increase in effectiveness being positively correlated with experience during the early years of teaching careers" (Ryans, 1960b, p. 1490).

In all of these studies, teacher experience was defined as years of teaching without regard to the relevance of that experience to the situation in which effectiveness was measured. One year of teaching high school mathematics was treated as equivalent to one year of teaching first grade. One year of teaching in an inner-city school was treated as equivalent to a year of teaching in an upper-middle-class suburban school. With experience defined in this loose manner, it is not surprising that some positive correlations are found with effectiveness in one study and some negative correlations are found in another study. It may be that relevant experience is positively correlated with effectiveness but that irrelevant experience (e.g., experience with a different grade level, school, subject matter) is uncorrelated or even negatively correlated with effectiveness. From the studies available, it is impossible to answer this question confidently.

In the present study, experience is defined in a more specific way, in terms of experience in the same laboratory situation, with the same kinds of students, and with exactly the same subject matter. The situation is not unlike that faced by teachers in junior and senior high schools every day, namely, teaching the same material to several classes of similar students.

Teacher Behavior and Student Achievement

A large number of correlational studies and a handful of experiments have investigated the relationships between teacher behavior and student achievement. Rosenshine (1971) and Dunkin and Biddle (1974) have reviewed this corpus in considerable detail. In general, the number of promising teacher behavior variables emerging from the research is small. Rosenshine and Furst (1971) proposed eleven teacher behavior variables as "promising" in their relationship to student achievement. The variables proposed were: (1) clarity, (2) variability, (3) enthusiasm, (4) task-oriented and/or businesslike behavior, (5) student opportunity to learn criterion material, (6) use of student ideas and general indirectness, (7) criticism, (8) use of structuring comments, (9) types of questions, (10) probing, and (11) level of difficulty of instruction, in that order. Relationships between single dimensions of teacher behavior and student achievement are generally weak, and the explanations of these correlations are tentative.

Heath and Nielson (1974) have criticized Rosenshine and Furst's selection of "promising" teacher variables on three grounds: the validity of operational definitions of teaching behavior used in the studies reviewed, the adequacy of experimental design and statistical analysis, and the "inherently trivial" effects of techniques of teaching on achievement compared to non-teaching variables such as socio-economic status and ethnic background. After reviewing the 50 studies cited by Rosenshine and Furst, Heath and Nielson concluded that 26 of the 84 operational definitions of teacher behavior do not correspond to the variable cited. That is, in almost one-third of the studies reviewed, the measure of

teacher behavior was judged to be invalid or inappropriate.

On the question of research design and statistical analyses, Heath and Nielson concluded that "the research design of most of these studies is fundamentally weak. Only five of the 78 citations report using random assignment of pupils to treatments, yet they employ statistical analyses the interpretation of which implies randomization" (Heath & Nielson, 1974, p. 475). In the vast majority of the studies reviewed, the statistical analyses reported make interpretation undependable, because important assumptions such as linearity, normality, homogeneity of variance and of regression slopes, are uninvestigated or unreported.

For more than half (45 of 78) of the teacher-behavior variables studied, "the original author did not claim to find a significant relation between the teacher behavior specified and student achievement" (Heath & Nielson, 1975, p. 476). Heath and Nielson concluded that the research literature on the relation between teacher behavior and student achievement fails to establish clear and significant relationships "because of sterile operational definitions of both teaching and achievement, and because of fundamentally weak research designs" (Heath & Nielson, 1974, p. 481). The present study was an attempt to meet many of the Heath and Nielson criticisms of research on teaching by use of random assignment of students, content relevant posttest measures, and tests of appropriate statistical assumptions.

CHAPTER III

THE STUDY

To investigate changes in teacher performance as a function of practice and to examine the relationships between teaching performance and student achievement and attitudes, experienced teachers taught a social studies unit to three different groups of junior high school students.

Design

Twelve experienced teachers were recruited: six males and six females. To test the effects of practice on teaching performance, each teacher taught the same social studies unit to three classes, each consisting of eight students. To test the effects of teaching performance on student learning, each student completed a multiple-choice recall test, an essay test, and an attitude inventory. The two-factor design (Practice X Teacher), with repeated measures on the teachers, is portrayed in Table 1. [Students taught on Day 3 returned four days later and were taught a new social studies unit by the same teacher as part of a separate study of student feedback to teachers (Crist, in preparation).]

Three days before teaching for the first time, each teacher was given two hours to read the text material and examine a set of color transparencies which were to be used in the teaching sessions. In addition, the teacher was given a document entitled "Information for Teachers" (Appendix A) which included a list of objectives to be achieved by students. At the beginning of each teaching day, each teacher was given 90 minutes to plan the teaching session. The students were given one hour to read the text material and view the color transparencies before entering class.

Table 1

Experimental design for the study: two factors (Practice X Teacher) with repeated measures on the teacher factor. For each teacher, Day 1 was a Monday, Day 2 a Wednesday, and Day 3 a Friday. A new group of 8 students was assigned to each teacher each day.

	Practice								
	Day 1			Day 2			Day 3		
Teacher	Students Read Text Material	Teachers Teach Three 50-minute Lessons	Student Posttests	Students Read Text Material	Teachers Teach Three 50-minute Lessons	Student Posttests	Student Read Text Material	Teachers Teach Three 50 minute Lessons	Student Posttests
1	X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X
3	X	X	X	X	X	X	X	X	X
4	X	X	X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X	X	X	X
8	X	X	X	X	X	X	X	X	X
9	X	X	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X	X	X
Control	X	0	X	X	0	X	X	0	X

Twenty-four students (eight on Monday, eight on Wednesday, and eight on Friday) were randomly assigned to a control condition. The control students read the text material and viewed the color transparencies with the students assigned to experimental classes before being informed that they were in the control group. Since the main questions of the study involved examining teacher performance over time rather than comparing a teaching condition with a non-teaching condition, the control group completed the recall and essay tests immediately after reading the text material and viewing the color transparencies. The control group did not receive the attitude inventory.

Teachers

Twelve experienced teachers (six males and six females) employed by local school districts participated in the study. They were paid volunteers recruited by the experimenter via telephone. The study was conducted during the summer months to avoid schedule conflict with the school calendar.

Six teachers held bachelors degrees and six held masters degrees. Their teaching experience ranged from 1 to 20 years with a median of 6.25 years. Seven had taught at more than one educational level. Table 2 shows the highest degree earned by each teacher, the educational levels at which each teacher had taught, and the number of years at each level.

Students

The students were paid volunteers recruited from six local junior high schools. The students (116 boys and 196 girls) had just completed the seventh, eighth, or ninth grade. Of these, 164 had just completed

Table 2

Teachers' Highest Degree and Years of Teaching Experience at Various Educational Levels

Teacher	Highest Degree	Years of Experience at Indicated Educational Level					
		Elementary	Junior High	Senior High	College	Substitute	Tot. Yrs Exper.
1	MS	16	4				20
2	BA	11	2				13
3	BA	2					2
4	BS	4	0.5			10	14.5
5	BA	7					7
6	MA			14	2		16
7	MA		5			0.5	5.5
8	BS	1					1
9	MAT	9	1				10
10	BA		4				4
11	MA		0.5			2	2.5
12	MA	1.5		1.5		1	4
						Median	6.25

seventh grade, 116 had just completed eighth grade, and 32 had just completed ninth grade.

Pretest Measures

Five paper and pencil instruments were used to obtain representative descriptions of the prior experiences and abilities of the teachers and students. Demographic information on the teachers was obtained by use of a teacher information questionnaire (Appendix B). Teacher demographic information included academic degree and year obtained, number of years of teaching experience at various grade levels and subject matters, and preferred grade level. Student demographic information including age, sex, school, grade, and prior experience in experimental teaching sessions was obtained using a student information questionnaire (Appendix C).

Ability tests. Four ability tests were administered to the teachers and students. These tests measured verbal ability (Extended Range Vocabulary Test, Parts I and II for teachers, and Vocabulary Test V-2, Parts I and II for students), reasoning ability (Necessary Arithmetic Operations, Parts I and II), analytic ability (Hidden Figures Test, Parts I and II) (French, et al., 1963), and conceptual level (Paragraph Completion Test) (Hunt, 1971). The first two of these tests measure variables traditionally associated with academic achievement. The latter two tests are measures of cognitive style which, while usually only slightly correlated with vocabulary and reasoning ability, are thought to be important in the learning process. The combination of the four ability tests, together with the demographic information, represents an unusually complete description of the experiences, characteristics, and abilities of the teachers and students who participated in the study.

Posttest Measures

Three instruments were administered to the students to measure the effects of instruction in this study. A 63-item multiple-choice Recall Test was administered to measure student recall of facts, principles, and ideas (Appendix D). This test consisted of items having four alternative answers. These items were written by graduate students in educational psychology who had read the text material from which the teachers subsequently taught.

To measure student cognitive achievement of higher order than simple recall, an Essay Test was administered to each student. The essay test consisted of each student drafting a letter to a hypothetical friend describing what it would be like to live in the town that was the subject of the teaching session. The essay test was scored by counting the number of concrete and abstract themes used by the students in composing the letter.

To measure the effects of teaching in the affective domain, an Attitude Inventory (Appendix E) was administered to each student in the experimental group at the end of the instructional day. The attitude inventory consisted of twenty-one statements of opinion about the subject matter taught, the teacher, and the students' performance in class. For each of these items, each student indicated the extent to which he or she agreed or disagreed with the opinion statement, using a five-point Likert scale ranging from "strongly agree" to "strongly disagree."

Procedures

Ability testing and orientation session. Students and teachers met in separate groups with the experimenter to obtain an orientation to the

study, to receive the schedule of activities, and to complete the ability tests. At the end of the testing and orientation session, teachers and students were given their class assignments. Students were each paid $2.00 for participation in the ability testing and orientation session.

Teacher preparation sessions. On the Friday before a group of teachers was to begin teaching, the teachers met with the experimenter and were given two hours to familiarize themselves with the text material and color transparencies to be used as the basis of instruction. The teachers were permitted to make notes and to mark up the text material during this session, but were not permitted to take any materials or notes home with them.

At the beginning of each teaching day, the text material and color transparencies were returned to the teachers to be used in a 90-minute planning session. During the planning sessions, the teachers were asked to "plan aloud" by speaking into a tape recorder. These data were collected as part of a study of teacher decision making reported separately (Clark and Joyce, 1975; Marx and Peterson, 1975). The teachers were permitted to take their text material, color transparencies, and notes into class.

Student preparation session. At the beginning of each teaching day, each student was given one hour in which to read through the same text material that the teachers were using. At the end of the reading period, the set of color transparencies was shown to the students as a group. Experimental students were then taken to their classrooms and control students completed the recall and essay tests.

Assignment of students to classes. The students were assigned to thirty-six classes (N=8) and a control group (N=24) by a random procedure, after being stratified on sex and verbal ability. Table 3 shows means and standard deviations for each student characteristic and ability variable for each class.

Teaching sessions. Three 50-minute teaching periods were conducted for each class. The first and second teaching periods were separated by a 15-minute break, and the second and third periods were separated by a one-hour lunch break.

Each classroom was equipped with a pair of remotely operated television cameras, a microphone, a chalkboard, a round table, nine chairs, a slide projector, and two wall maps. Students were supplied with paper and pencils, and each teacher had a copy of the text material, a set of the color transparencies, and his or her notes made while preparing to teach.

Student posttesting session. At the end of each day of teaching, the students were taken to a large room for testing. The recall test, essay test, and attitude inventory were administered. After testing, the students were shown brief segments of videotape of their teaching sessions, paid $5.00 and dismissed.

Teacher debriefing session. At the end of each day of teaching, each teacher ranked the eight students taught on predicted cognitive achievement and attitude inventory scores as part of a separate study of teacher perception of students (Marx, in preparation). Also at this time, teachers were shown brief segments of the videotapes of their teaching and interviewed concerning their interactive decision making as part of a study of teacher decision making (Clark and Joyce, 1975; Marx and Peterson, 1975).

Table 3

Student Characteristics

Teacher	Class	Sex		Means and Standard Deviations for Each Class (standard deviations in parentheses) (N=8 per class)				
		Boys	Girls	Grade	Vocabulary	Necessary Arithmetic Operations	Hidden Figures	Paragraph Completion
1	1	3	5	7.7(0.5)	17.0(7.6)	13.6(4.5)	6.3(2.4)	1.3(0.4)
	2	3	5	7.1(0.3)	15.4(3.9)	12.5(4.5)	10.1(6.1)	1.2(0.2)
	3	3	5	8.0(0.9)	14.9(3.4)	14.9(5.3)	11.9(6.5)	1.3(0.4)
2	1	3	5	7.9(0.8)	17.4(5.4)	16.5(2.9)	7.8(2.7)	1.2(0.3)
	2	3	5	7.9(0.9)	14.5(6.7)	13.6(5.6)	8.3(5.6)	1.2(0.2)
	3	3	5	7.5(0.7)	15.5(4.8)	14.1(2.6)	8.6(2.7)	1.3(0.3)
3	1	3	5	7.7(0.7)	15.2(3.3)	13.2(2.3)	7.6(4.0)	1.3(0.2)
	2	3	5	7.5(0.5)	16.6(4.8)	12.2(3.8)	9.8(3.0)	1.1(0.1)
	3	2	6	7.5(0.7)	15.0(5.5)	11.7(5.3)	8.9(3.0)	1.1(0.1)
4	1	3	5	7.4(0.5)	16.4(4.3)	13.6(3.7)	7.3(4.5)	1.2(0.2)
	2	3	5	7.4(0.5)	14.0(4.1)	11.6(4.5)	8.1(4.6)	1.1(0.1)
	3	3	5	7.6(0.5)	15.0(5.4)	14.4(5.4)	7.8(4.9)	1.2(0.2)
5	1	3	5	8.0(0.8)	14.7(5.2)	12.9(4.2)	6.8(5.0)	1.2(0.2)
	2	3	5	7.9(0.6)	15.0(7.8)	12.2(3.2)	7.8(5.2)	1.2(0.1)
	3	3	5	7.2(0.5)	15.2(4.1)	12.2(3.9)	8.5(6.0)	1.3(0.2)
6	1	3	5	7.7(0.9)	15.0(3.9)	11.0(4.0)	9.4(3.2)	1.2(0.2)
	2	3	5	7.4(0.5)	15.6(5.3)	12.5(5.2)	10.1(3.6)	1.2(0.3)
	3	4	4	7.9(1.0)	13.4(6.3)	13.4(3.7)	11.1(5.5)	1.1(0.2)
7	1	3	5	7.7(0.7)	14.2(6.6)	11.4(5.4)	8.8(5.3)	1.3(0.2)
	2	3	5	7.6(0.5)	16.1(6.0)	13.1(5.1)	10.1(4.4)	1.2(0.4)
	3	4	4	7.2(0.5)	13.6(4.3)	12.7(4.6)	8.4(6.1)	1.3(0.2)
8	1	4	4	7.6(0.5)	15.4(3.9)	13.2(3.8)	8.8(6.2)	1.2(0.2)
	2	3	5	7.6(0.7)	15.4(5.6)	13.7(3.7)	8.0(4.8)	1.4(0.5)
	3	4	4	7.7(0.7)	14.1(2.8)	11.1(5.5)	8.5(4.6)	1.4(0.5)
9	1	3	5	7.9(0.8)	14.1(6.1)	15.1(5.4)	8.5(3.3)	1.5(0.6)
	2	4	4	7.5(0.7)	16.6(7.1)	13.5(7.5)	10.1(4.9)	1.3(0.2)
	3	3	5	7.5(0.5)	14.1(5.9)	12.0(3.2)	9.2(3.8)	1.1(0.1)
10	1	3	5	7.2(0.5)	15.1(4.2)	15.2(6.6)	7.3(6.0)	1.4(0.3)
	2	3	5	7.9(0.8)	17.1(4.3)	12.9(3.1)	8.3(3.2)	1.3(0.3)
	3	3	5	7.7(0.7)	15.6(6.1)	12.0(3.2)	6.3(2.9)	1.2(0.2)

Table 3--Continued

Student Characteristics

Means and Standard Deviations for Each Class
(standard deviations in parentheses)
(N=8 per class)

Teacher	Class	Sex		Grade	Vocabulary	Necessary Arithmetic Operations	Hidden Figures	Paragraph Completion
		Boys	Girls					
11	1	3	5	7.4(0.7)	18.7(4.3)	12.2(3.6)	8.6(4.2)	1.3(0.3)
	2	2	6	7.5(0.5)	15.4(2.1)	11.5(3.2)	7.6(3.0)	1.2(0.2)
	3	4	4	7.6(1.1)	13.7(6.8)	13.2(5.4)	7.4(5.2)	1.1(0.2)
12	1	3	5	7.5(0.9)	17.0(6.7)	16.2(2.9)	9.9(5.4)	1.3(0.2)
	2	3	5	7.5(0.7)	13.7(6.7)	12.4(3.9)	8.3(3.0)	1.2(0.3)
	3	3	5	7.5(0.5)	12.6(5.1)	13.7(3.4)	8.6(6.2)	1.2(0.2)
Control	1	3	5	7.4(0.5)	14.4(4.4)	13.6(5.4)	9.1(6.5)	1.1(0.1)
	2	3	5	7.1(0.4)	14.3(7.4)	11.0(4.1)	6.9(7.7)	1.2(0.5)
	3	3	5	7.5(0.5)	15.1(3.5)	13.4(5.4)	9.0(5.7)	1.2(0.2)
Total Day 1 (n=104)		3	5	7.6(0.7)	15.7(5.1)	13.7(4.4)	8.2(4.5)	1.3(0.3)
Total Day 2 (n=104)		3	5	7.5(0.6)	15.4(5.5)	12.5(4.4)	8.7(4.5)	1.2(0.3)
Total Day 3 (n=104)		3	5	7.6(0.7)	14.5(4.8)	13.0(4.4)	8.8(4.9)	1.2(0.3)
Grand Total (N=312)		3	5	7.6(0.7)	15.2(5.1)	13.1(4.4)	8.6(4.6)	1.2(0.3)

The teachers were not given feedback on student achievement and attitude posttest scores. This study was an attempt to investigate the effects of the minimal feedback that a teacher received from the process of interacting with students--a feedback condition comparable to that of the two tutoring studies referred to above. A later study in this series (Crist, in preparation) investigated the effects of feedback of student perceptions of teacher behavior on subsequent teacher behavior. Additional kinds of feedback to teachers could be investigated in future studies of this series.

CHAPTER IV

RESULTS AND DISCUSSION

The data were analyzed in two stages. First, the student posttest variables were analyzed for effects attributable to student characteristics and teacher practice. Second, teacher performance (as characterized by teacher-student interaction variables) was analyzed in relation to teacher practice and student posttest variables.

Student Posttest Variables

Five student posttest variables were used in the analyses: Recall Test score, number of concrete themes in the Essay Test, number of abstract themes in the Essay Test, and two Attitude Inventory scores: Attitude Toward the Teaching Situation and Attitude Toward Self as learner. Table 4 shows the intercorrelation matrix with means and standard deviations for the five student posttest variables and six student characteristic and aptitude variables. Coefficients significant at or beyond the .05 level are discussed below.

For this group of students, sex was slightly related to grade level, Paragraph Completion, Recall Test score, Essay Test Abstract score, Attitude Toward the Situation, and Attitude Toward Self. Sex correlated moderately with Essay Test Concrete. (The data for sex were coded as male = 1, female = 2.) None of the correlations with sex are particularly striking in magnitude.

Not surprisingly, grade level was slightly related to Vocabulary, Necessary Arithmetic Operations, Hidden Figures, Recall Test score, Essay Concrete, and Essay Abstract. The older and more experienced students should be expected to have somewhat more extensive vocabularies and to

Table 4

Intercorrelations, Means, and Standard Deviations of Student Characteristics, Aptitudes and Posttest Measures (N=312)

			Pretest Variables						Cognit. Achieve. Vars.			Attitude Variables	
	Mean	SD	Sex	Grade	Vocab.	N.A.O.	H.Figs.	Para. Compl.	Recall	Essay Concr.	Essay Abstr.	Attit: Situa.	Attit: Self
Pretest Variables													
Sex (1=M, 2=F)	1.6	0.5		.15**	-.01	-.01	.04	.17**	.13*	.36**	.17**	.14**	.12*
Grade Level	7.6	0.7			.22**	.18**	.13*	.34**	.20**	.14**	.17**	-.05	-.01
Vocabulary	15.2	5.2				.52**	.33**	.29**	.51**	.17**	.08	-.03	.19**
Neces. Arith. Opers.	13.1	4.4					.36**	.20**	.48**	.28**	.01	.02	.18**
Hidden Figures	8.5	4.7						.07	.19**	.15**	.02	-.08	.06
Para. Completion	1.2	0.3							.26**	.22**	.18**	.12*	.23**
Cognitive Achievement Variables													
Recall Test	40.0	8.2								.36**	.18**	.12*	.23**
Essay Test Concrete	11.8	5.4									.12*	.15**	.15**
Essay Test Abstract	2.1	1.8										-.03	.06
Attitude Variables													
Att. Toward Situa.[a]	57.4	10.3											.50**
Att. Toward Self[a]	15.5	2.8											

[a] N = 288. Control Group students did not receive the attitude inventory.

*p ≤ .05

**p ≤ .01

be generally more "test wise" (the Vocabulary, Necessary Arithmetic Operations, Hidden Figures, and Recall Tests were all multiple-choice instruments). Grade level correlated moderately with Paragraph Completion.

Vocabulary correlated substantially with necessary Arithmetic Operations and Recall Test score, but only slightly to moderately with Hidden Figures, Paragraph Completion, Essay Test Concrete score, and Attitude Toward Self. These findings indicate that the constructs measured by the Necessary Arithmetic Operations and Vocabulary instruments overlap and that their common factor is positively related to recall achievement. Paragraph Completion, on the other hand, is less strongly related to Vocabulary, Necessary Arithmetic Operations, and Recall Test score.

Necessary Arithmetic Operations correlated substantially with Recall Test score, moderately with Hidden Figures and Essay Test Concrete score, and slightly with Paragraph Completion and Attitude Toward Self. As mentioned above, it is not surprising that general reasoning ability (the construct said to be measured by the Necessary Arithmetic Operations instrument) is a fairly good predictor of achievement.

Hidden Figures score was moderately correlated with Vocabulary and Necessary Arithmetic Operations but only slightly correlated with Recall and Essay Test Concrete.

Paragraph Completion was uncorrelated with Hidden Figures but correlated slightly to moderately with all other student characteristics, aptitudes, and student posttest measures.

Among the posttest measures, the highest correlation was between Attitude Toward the Situation and Attitude Toward Self. In addition to

the conceptual relationship between these variables, they were measured with different scales of the same instrument. Recall Test score correlated moderately with Essay Test Concrete; this correlation is not surprising since the process of responding to a recall test and remembering concrete facts on which to base an essay seem to be similar. Essay Abstract correlated only slightly with Recall Test score.

The correlation of the two attitude scales with other variables provide some support for the validity of the attitude inventory. Attitude Toward Self is more strongly related to Vocabulary, Necessary Arithmetic Operations, Paragraph Completion, and Recall Test score than is Attitude Toward the Situation. Attitude Toward Self might be thought of as a measure of academic self-concept, and it would therefore be expected to correlate more highly with student aptitudes and achievement than the Attitude Toward the Situation score which is a more situation-specific measure.

In summary, the student characteristics and aptitude measures were only slightly to moderately intercorrelated, with the exception of Vocabulary and Necessary Arithmetic Operations which were substantially correlated. The posttest measures were only slightly intercorrelated except for the two attitude measures. The best predictors of posttest scores were Vocabulary and Necessary Arithmetic Operations.

Student Characteristics and Aptitudes

To determine whether all classes were comparable in their student characteristics and aptitudes, the class means in Table 3 were examined. Class means for five of the six student characteristics and aptitudes (Sex, Grade, Necessary Arithmetic Operations, Hidden Figures, and

Paragraph Completion) were found to vary nonsignificantly across classes. Class means for Vocabulary were found to vary significantly. This finding indicated that student posttest measures which were correlated with Vocabulary should be adjusted by analysis of covariance if the necessary statistical assumptions could be met.

Teacher Practice and Student Posttest Variables

Table 5 summarizes the student posttest data for the Recall Test (adjusted for Vocabulary and Necessary Arithmetic Operations), the Essay Test, and the Attitude Inventory for each day of teaching. To test the effects of teacher practice on student posttest variables, a two-factor analysis of variance was performed (Teacher X Day) on each variable. Recall Test scores were adjusted for differences in Vocabulary and Necessary Arithmetic Operations scores by analysis of covariance. Complete analysis of variance tables are presented in Appendix E.

For the Recall Test, on the average, adjusted class means were relatively stable from Day 1 to Day 2 and then decreased significantly from Day 2 to Day 3. That is, the classes taught on the first two days tended to score highest and the classes taught on the third day tended to score lowest. The absence of a significant Teacher Effect and Teacher X Day interaction indicates that within days, teacher effectiveness as measured by the Recall Test was similar across teachers.

For Essay Test Concrete and Essay Test Abstract, two-way analysis of variance (Teacher X Day) indicated that these scores were stable across teacher and day. That is, neither amount of teacher practice nor the effects of particular teachers are reflected by these variables.

Table 5

Means and Standard Deviations of Student Posttest Variables for Each Day

	Day 1		Day 2		Day 3	
	Mean	SD	Mean	SD	Mean	SD
Experimental Group						
Recall Test[a]	39.51	7.35	40.44	7.08	37.56	9.20
Essay Test Concrete	12.22	5.69	11.67	4.74	11.15	5.35
Essay Test Abstract	2.04	1.74	2.09	1.66	2.20	1.88
Attitude Toward Situation	57.79	11.06	59.15	8.84	55.32	10.44
Attitude Toward Self	15.37	2.88	15.89	2.68	15.21	2.72
Control Group						
Recall Test[a]	40.32	3.62	33.46	13.59	38.61	7.07
Essay Test Concrete	11.75	7.40	12.12	5.79	13.87	6.68
Essay Test Abstract	1.87	2.41	2.62	1.59	2.50	2.45

[a]Recall Test means are adjusted for Vocabulary and Necessary Arithmetic Operations test scores.

Attitude Toward the Situation scores showed a mean increase from Day 1 to Day 2 and a decrease from Day 2 to Day 3. That is, the classes taught on the teachers' second day of teaching expressed more positive attitudes toward the teaching situation than did the classes taught on a teachers' first and third days of teaching. A significant Teacher Effect indicates that within a given day class mean scores on this variable differed significantly from one another. This is especially noticeable on Day 3 where mean scores range from 37.75 to 63.62. For this variable, the Teacher X Day interaction was also significant. That is, the unique combination of a particular teacher and a particular day was associated with a particular (high or low) Attitude Toward the Situation.

Attitude Toward Self mean scores did not change significantly across days. A significant teacher effect for this variable indicated that, over all days, class means for the various teachers differed significantly from one another.

In all of these trends, there were notable differences among teachers. Some showed increasing trends with practice on some variables, suggesting positive "learning to teach." Others showed negative "learning to teach." Table 6 shows means of student posttest measures for each class, grouped by teacher. Figures 2 through 6 display class means for each teacher for each day on each student posttest variable.

For adjusted Recall Test mean scores (Fig. 2), two patterns predominate. Four teachers (Teachers 1, 2, 4, and 8) are relatively ineffective on Day 1 but then are among the most effective on Day 2. On Day 3, these four teachers decline in effectiveness but not to the low level of Day 1 (with the exception of Teacher 4). The remaining eight teachers tend to decline in effectiveness from Day 1 to Day 2 and Day 2

to Day 3. Only one of the twelve teachers (Teacher 3) improved in effectiveness from Day 2 to Day 3, and this was only a slight improvement.

For Essay Test Concrete (Fig. 3), the picture is more complex. Four teachers (Teachers 2, 3, 4, and 8) decreased in score on Day 2 and then increased in score on Day 3. Teachers 1, 7, and 11 exhibited the opposite patterns, with scores increasing on Day 2 and dropping on Day 3. The mean scores for two teachers (6 and 10) increased systematically with practice, and the mean scores for three teachers (5, 9, and 12) decreased systematically with practice.

The patterns for Essay Test Abstract (Fig. 4) are similar to those for Essay Test Concrete. Four teachers (Teachers 2, 3, 9, and 12) increased in score on Day 2 and decreased on Day 3. None of these teachers had exhibited this pattern for Essay Test Concrete. Three teachers (Teachers 4, 5, and 11) decreased in score on Day 2 and increased on Day 3. Only Teacher 4 had previously exhibited this pattern on the Essay Test Concrete variable. Teachers 1, 7, and 8 systematically improved their scores with practice and Teachers 6 and 10 changed very little with practice.

In Fig. 5, the dominant pattern for Attitude Toward the Situation mean scores (Teachers 1, 2, 7, and 8) shows an increase in positive attitude on Day 2 and a decrease on Day 3. The opposite pattern, decreasing on Day 2 and increasing on Day 3 was manifested by Teachers 3, 5, and 12. Generally decreasing trends were shown by Teachers 6, 9, and 11, with Teachers 9 and 11 decreasing precipitously on Day 3 and Teacher 6 decreasing more sharply on Day 2 than on Day 3.

Attitude Toward Self mean scores (Fig. 6) produced patterns similar to Attitude Toward the Situation. Again, the dominant pattern (Teachers

2, 7, 10, and 11) involved an increase in positive attitude on Day 2 and a decrease on Day 3. Only Teacher 6 showed the opposite pattern, decreasing on Day 2 and increasing again on Day 3. Four teachers (Teachers 1, 4, 9, and 12) showed a generally decreasing pattern with practice, and three teachers (Teachers 3, 5, and 8) showed increased scores with practice.

Table 6

Means and Standard Deviations of Student Posttest Measures for Each Class

Teacher	Class	Recall Test[a]		Essay Concrete		Essay Abstract		Attitude Toward Situa.		Attitude Toward Self	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
1	1	36.71	(11.40)	11.87	(6.53)	2.12	(1.45)	62.00	(7.69)	16.87	(3.18)
	2	45.32	(2.97)	14.75	(4.39)	2.50	(2.07)	67.37	(5.01)	16.50	(2.07)
	3	39.80	(8.17)	12.87	(4.01)	2.62	(2.06)	63.62	(8.43)	16.50	(2.87)
2	1	36.46	(8.79)	14.62	(4.83)	2.00	(2.00)	58.75	(6.69)	14.87	(3.56)
	2	41.52	(8.38)	10.37	(5.20)	2.25	(1.28)	63.25	(7.95)	17.50	(1.51)
	3	40.48	(7.72)	11.50	(5.09)	0.62	(0.91)	57.62	(6.47)	15.87	(2.85)
3	1	42.16	(3.24)	15.00	(6.23)	1.87	(0.64)	58.75	(14.82)	14.62	(3.06)
	2	39.26	(4.83)	11.75	(4.16)	3.00	(1.85)	59.12	(8.90)	15.75	(2.81)
	3	39.35	(5.37)	12.75	(4.89)	2.37	(1.59)	59.00	(9.91)	16.25	(2.37)
4	1	39.76	(5.65)	13.62	(6.13)	1.87	(1.55)	54.50	(11.98)	16.00	(2.39)
	2	41.91	(7.30)	11.25	(4.71)	0.87	(1.35)	54.00	(9.14)	14.37	(1.99)
	3	35.69	(10.70)	12.37	(3.54)	2.37	(1.59)	54.87	(7.64)	14.25	(2.43)
5	1	42.51	(6.31)	12.05	(6.50)	3.87	(2.99)	61.00	(12.21)	14.37	(2.97)
	2	41.91	(2.71)	11.50	(5.47)	2.75	(1.83)	57.50	(5.45)	15.12	(2.74)
	3	39.17	(7.06)	11.25	(4.86)	3.37	(3.02)	59.50	(7.05)	16.37	(2.44)
6	1	37.70	(7.18)	10.00	(5.87)	2.00	(2.13)	62.12	(8.52)	16.12	(3.18)
	2	36.33	(9.15)	11.12	(3.44)	1.87	(0.99)	57.25	(9.28)	14.62	(3.46)
	3	34.09	(11.00)	12.00	(7.57)	1.62	(0.91)	56.37	(6.27)	15.87	(2.03)
7	1	40.07	(5.73)	10.87	(5.84)	0.87	(0.99)	45.37	(8.45)	12.50	(2.32)
	2	38.70	(6.03)	14.37	(4.74)	1.37	(1.50)	59.75	(10.60)	15.25	(2.91)
	3	37.12	(9.94)	11.12	(5.27)	2.62	(2.06)	47.00	(7.21)	12.62	(2.06)
8	1	35.47	(7.76)	10.87	(4.94)	1.50	(1.41)	51.25	(12.37)	14.50	(2.07)
	2	43.65	(4.22)	9.37	(2.77)	2.00	(1.41)	64.75	(9.37)	16.50	(3.33)
	3	40.29	(6.21)	13.37	(6.78)	3.87	(2.79)	61.50	(7.80)	17.12	(1.35)
9	1	36.38	(9.96)	10.25	(4.65)	1.75	(1.28)	60.37	(6.98)	15.75	(2.86)
	2	35.72	(11.19)	8.62	(3.20)	2.12	(0.83)	58.87	(6.51)	15.12	(3.83)
	3	34.73	(8.65)	8.25	(4.02)	1.50	(0.75)	37.73	(8.90)	13.25	(2.37)

[a]Recall Test scores are adjusted for Vocabulary and Necessary Arithmetic Operations scores.

Table 6 (Continued)

Means and Standard Deviations of Student Posttest Measures for Each Class

Teacher	Class	Recall Test[a]		Essay Concrete		Essay Abstract		Attitude Toward Situa.		Attitude Toward Self	
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
10	1	39.45	6.31	12.00	6.50	2.25	1.83	62.25	10.91	16.75	3.10
	2	40.63	6.52	12.75	5.70	1.87	1.64	61.75	5.09	18.12	1.55
	3	37.52	7.74	13.87	4.58	1.87	1.80	61.37	5.60	16.37	2.32
11	1	44.38	3.89	9.87	5.13	2.50	1.60	54.75	11.10	15.87	1.88
	2	40.71	5.52	13.12	6.91	1.75	1.16	52.62	10.52	16.37	3.06
	3	34.75	12.26	5.87	5.79	2.00	1.06	44.37	6.73	12.62	2.87
12	1	41.04	5.35	15.12	4.91	1.87	1.35	61.37	9.91	16.25	2.25
	2	39.68	9.63	11.12	3.87	2.75	2.86	57.62	8.14	15.50	0.92
	3	37.71	14.19	8.62	3.54	1.62	1.18	60.87	6.42	15.37	2.19
Control		36.91		12.58		2.33		—	--	--	--

[a]Recall Test scores are adjusted for Vocabulary and Necessary Arithmetic Operations scores.

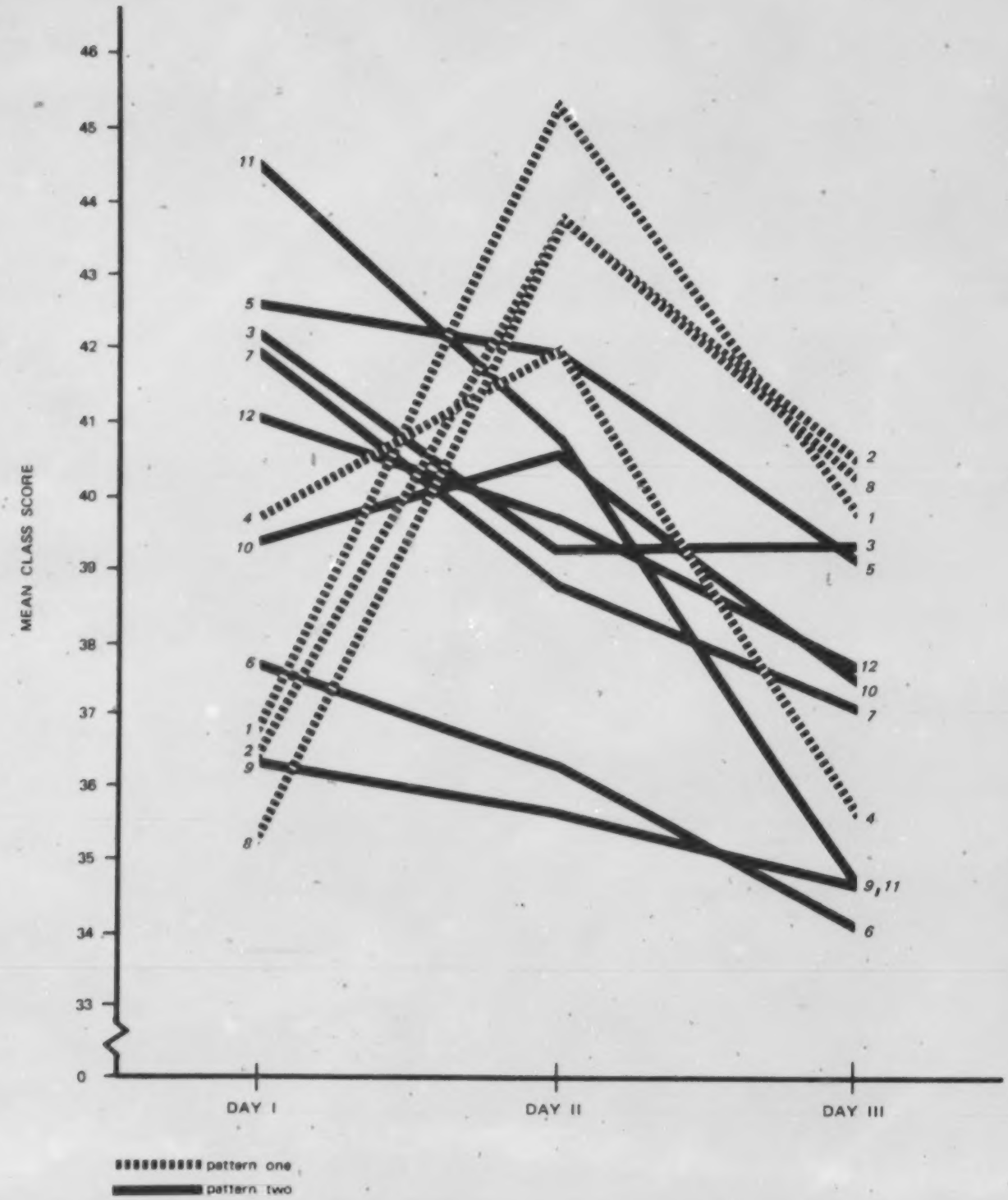


Fig. 2. Mean class scores on Recall Test for Days I to III, adjusted for vocabulary and reasoning ability. (Numbers identify individual teachers.)

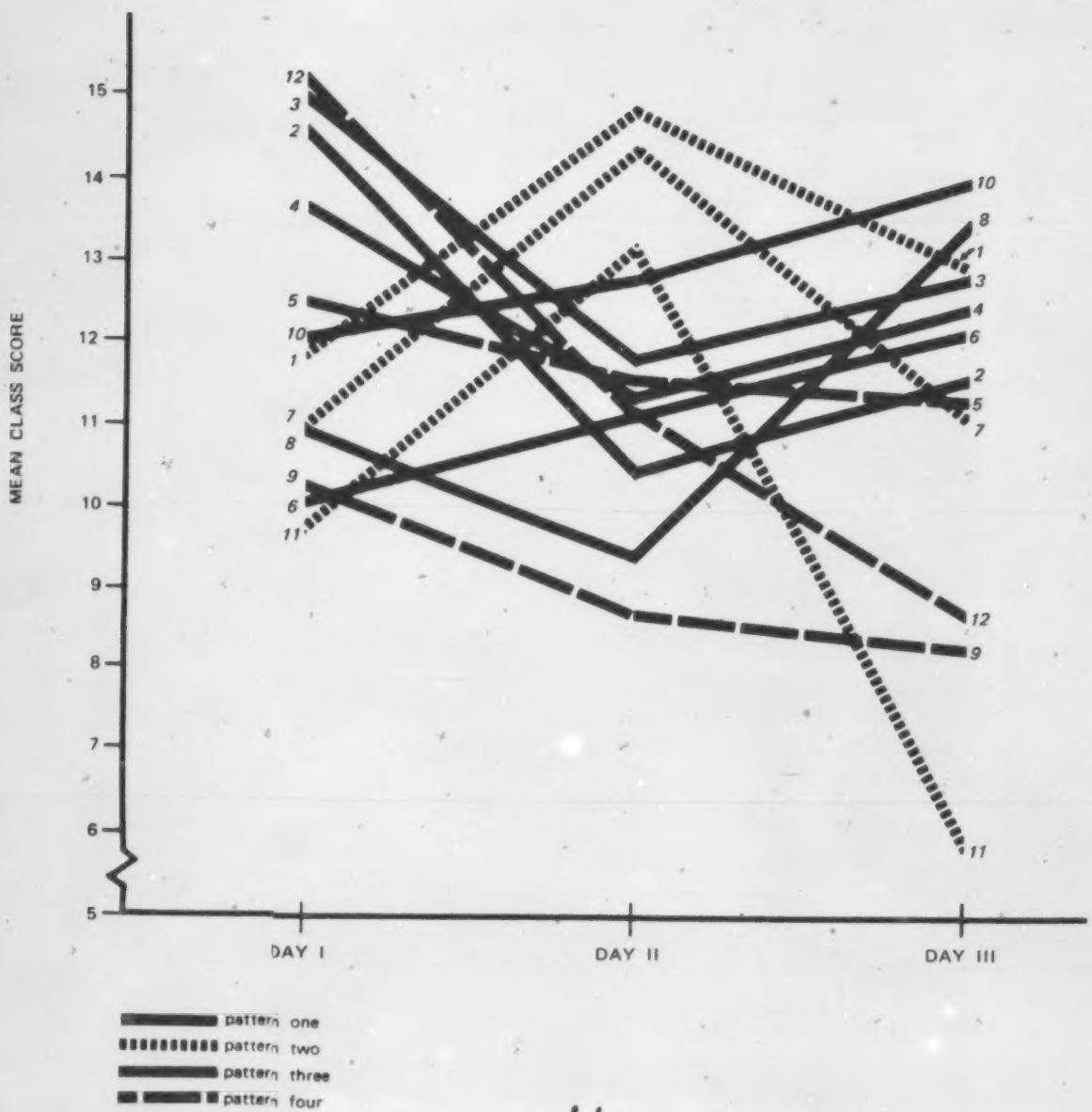


Fig. 3. Mean class scores on Essay Test Concrete for Days I to III. (Numbers identify individual teachers.)

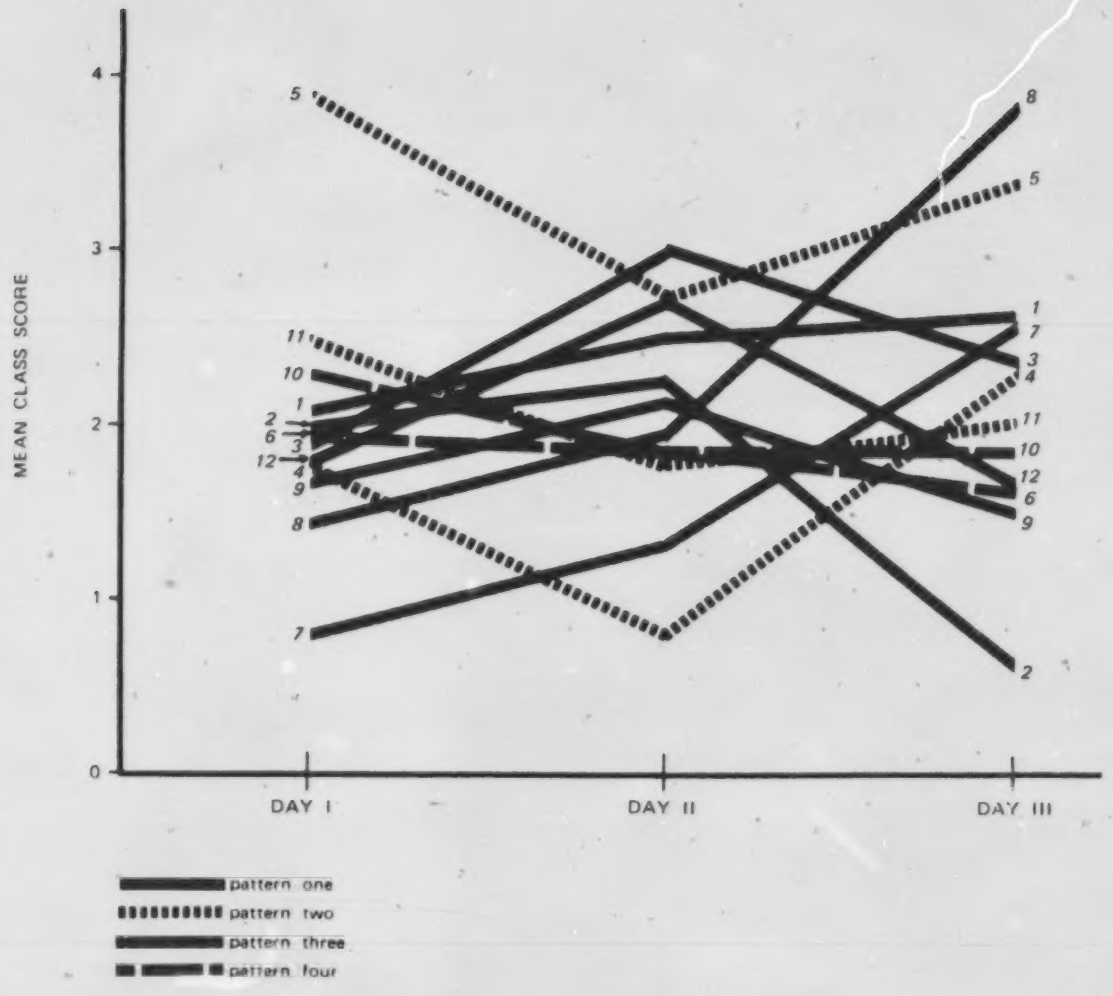


Fig. 4. Mean class scores on Essay Test Abstract for Days I to III. (Numbers identify individual teachers.)

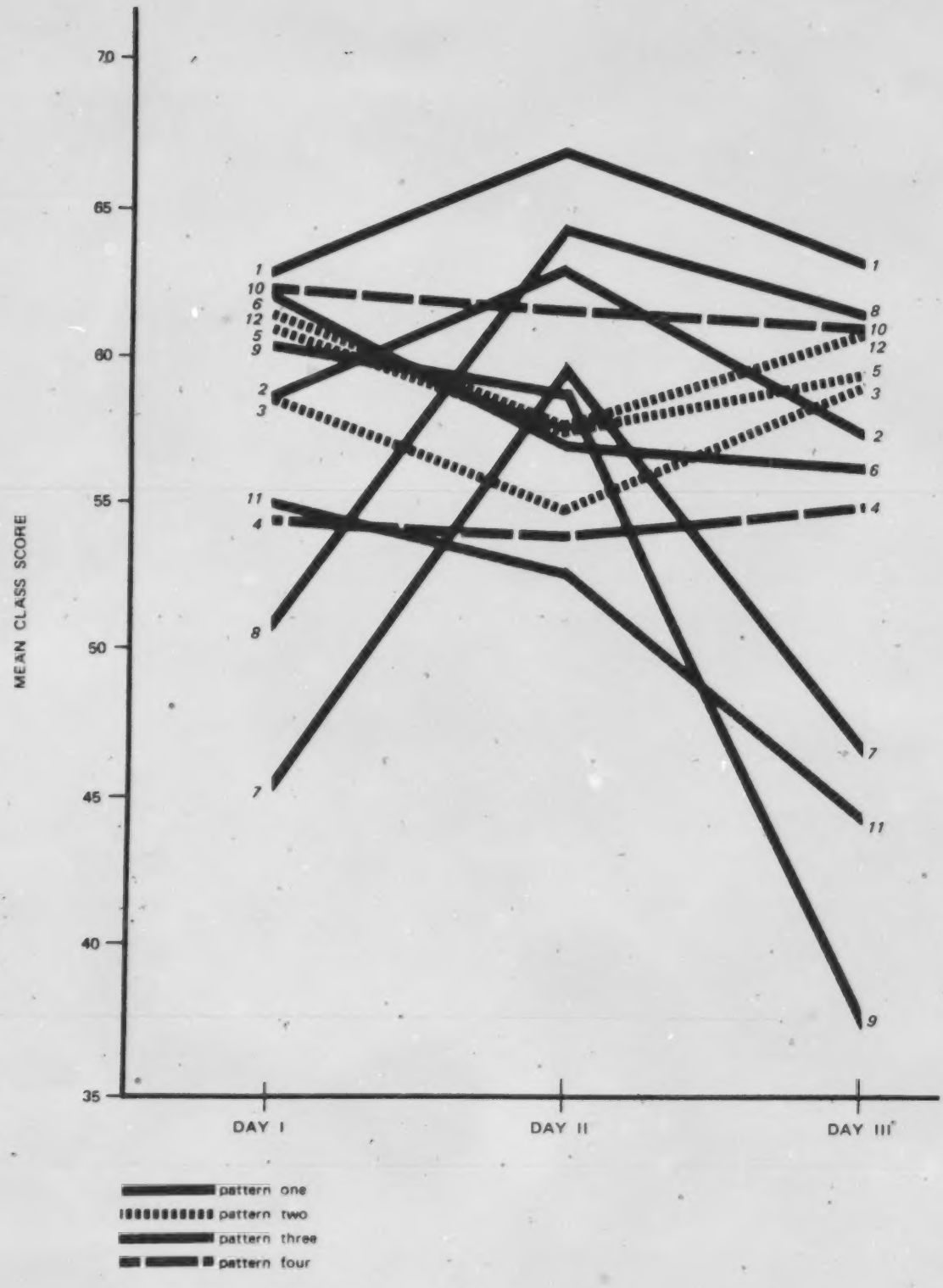


Fig. 5. Mean class scores on Attitude Toward the Situation tests for Days I to III. (Numbers identify individual teachers.)

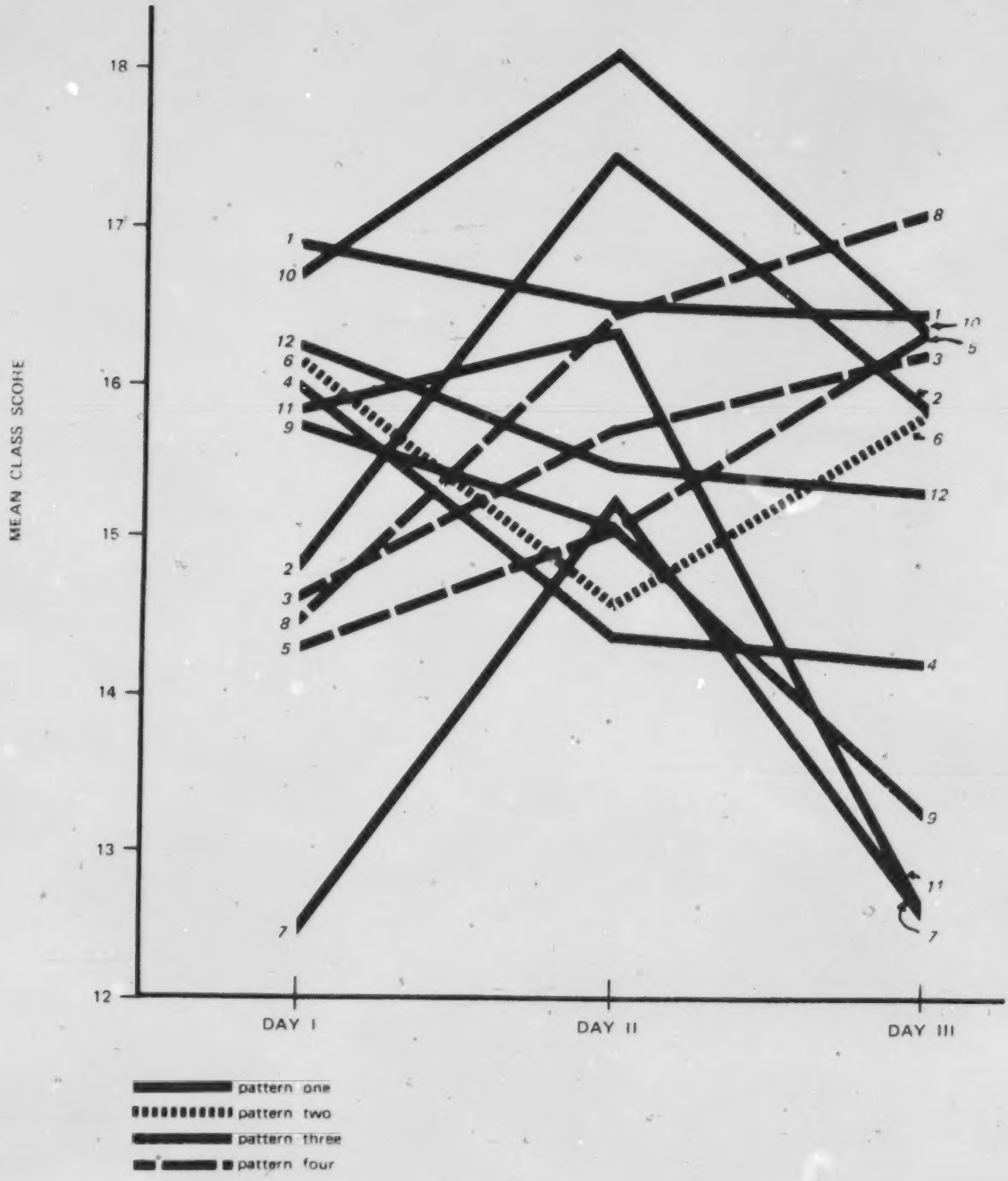


Fig. 6. Mean class scores on Attitude Toward Self tests for Days I to III. (Numbers identify individual teachers.)

To what extent did the teachers in this study promote high student achievement on both the cognitive and affective posttest measures? Figure 7 shows mean Adjusted Recall posttest scores plotted against mean Attitude Toward Situation posttest scores for each class. The plot has been divided into quadrants by constructing axes which intersect at the mean values obtained over all days and teachers for adjusted Recall Posttest and Attitude Toward Situation. Thus, points in quadrant I represent classes in which both achievement and attitude were above average, points in quadrant II represent classes in which achievement was below average and attitude was above average, and so forth.

The largest number of classes (15 of 32) appeared in quadrant I. This indicates that, in almost half of the classes, high achievement and positive attitude occurred together. All three of the classes taught by teacher 5 appeared in quadrant I and two of the three classes taught by teachers 1, 2, 3, 8, 10, and 12 appeared in quadrant I. Relative to the twelve teachers in this study, the seven teachers whose classes appeared in quadrant I were most effective in achieving both the cognitive and affective learning objectives.

Eight classes appeared in quadrant II. Four of the classes in quadrant II were taught by teachers whose other classes appeared in quadrant I. This indicates that, for this sample of teachers, a drop in class performance for the more effective teachers is more likely to be reflected in student achievement than in student attitude. Classes taught by teachers 6, 7, and 9 constitute the remaining classes in quadrant II. Teacher 9 was the only teacher with more than one class in quadrant II, indicating that this teacher's typical performance pattern was low student achievement combined with positive student attitude.

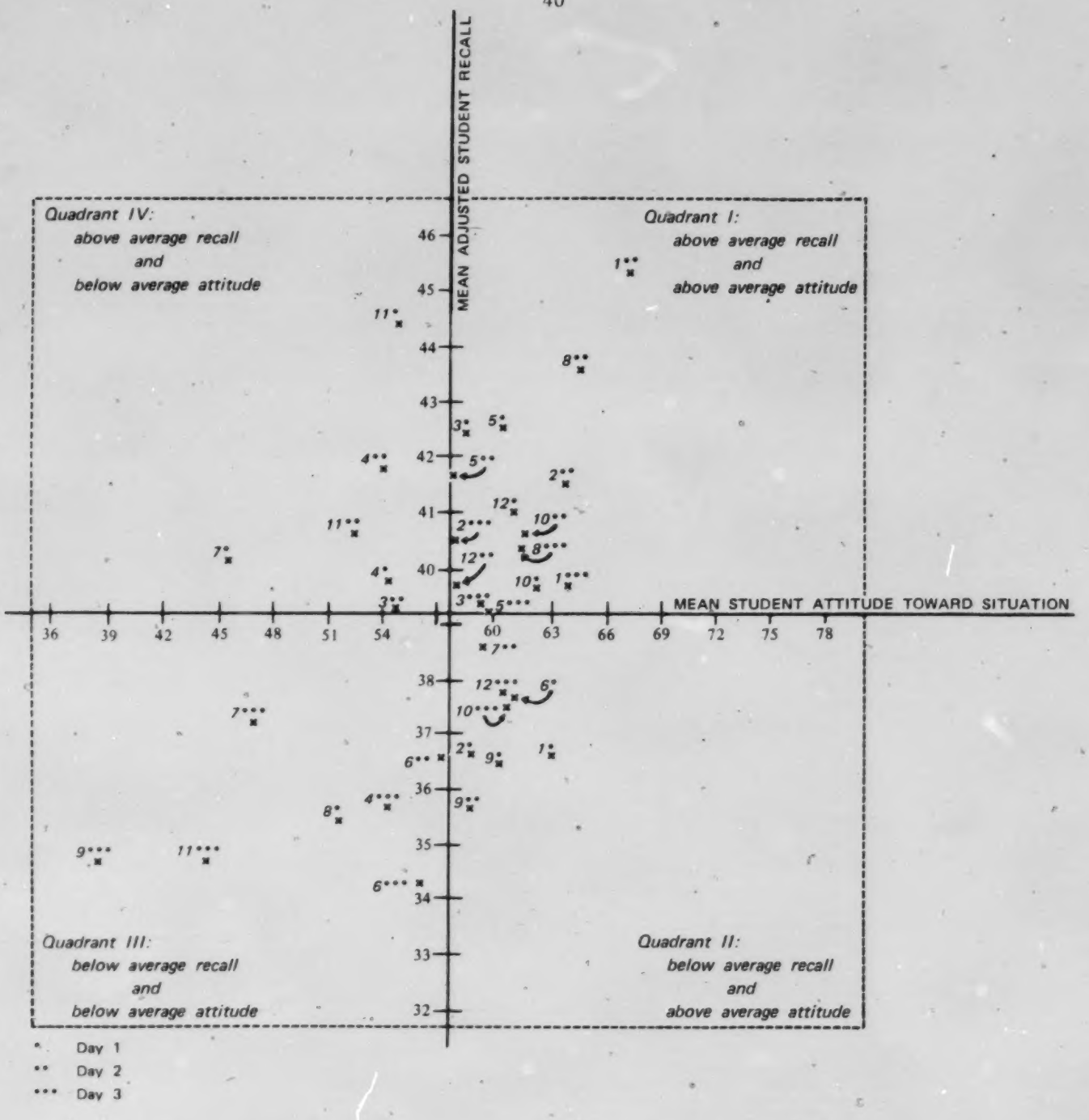


Fig. 7. Mean adjusted student recall posttest scores plotted against mean student attitude toward situation for each class. (Origin represents grand mean of each variable. Each point plotted is numbered to indicate the teacher for the class.)

In quadrant III, seven classes appeared in which both achievement and attitude were below average. Teachers 6, 7, and 9 were represented in both quadrants II and III, indicating that classes taught by these teachers were least successful in achieving the cognitive learning objectives. Teacher 6, with two classes in quadrant III, had a typical performance pattern of low student achievement and relatively negative student attitude.

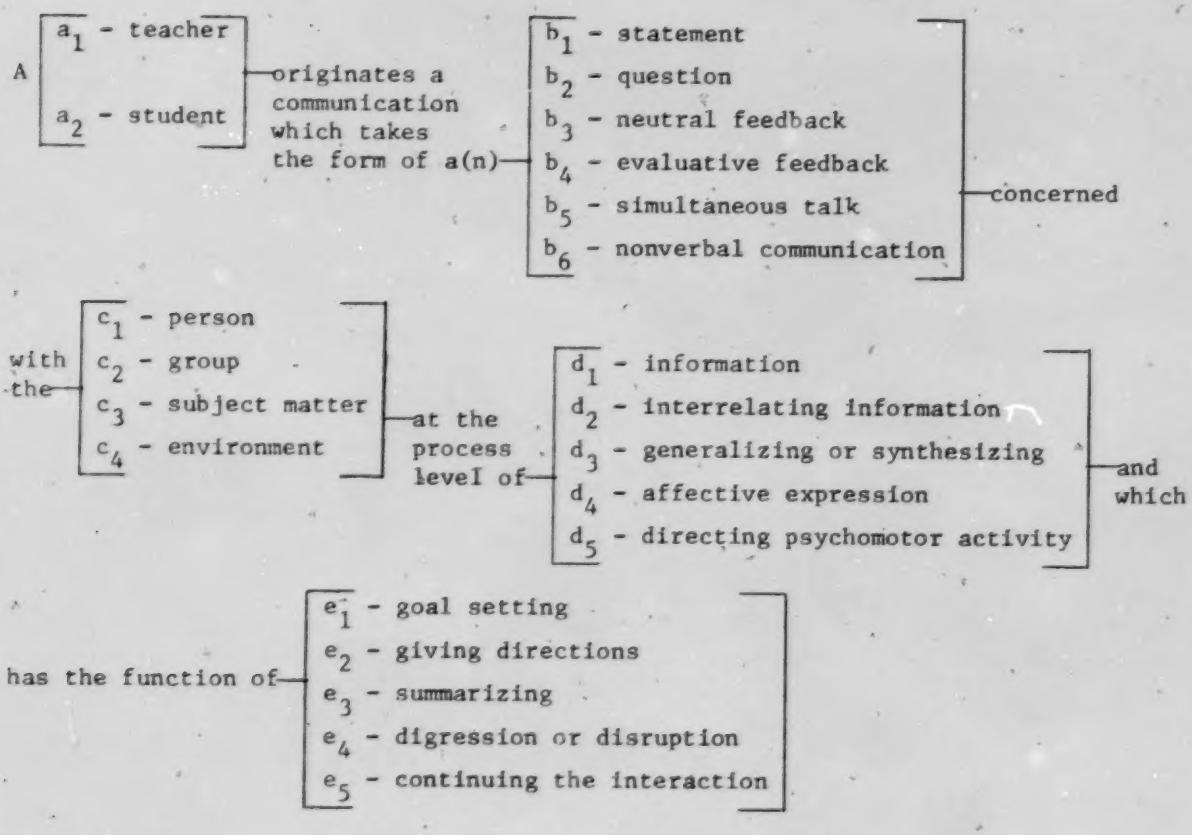
Only six classes appeared in quadrant IV, indicating that it was unusual to find above average achievement paired with below average attitude in this sample. Teachers 4 and 11 were each represented twice in quadrant IV and once in quadrant III. That is, all students taught by these two teachers expressed relatively negative attitudes, but two classes of the three taught by each performed above average on the achievement test.

Teaching Process Variables

Teaching process was described by coding classroom interaction from videotapes made during each teaching session. Classroom interaction was described in terms of five mutually exclusive and exhaustive facets as follows:

1. Facet A: Originator
   - a_1 - teacher
   - a_2 - student
2. Facet B: Type of Communication
   - b_1 - statement
   - b_2 - question
   - b_3 - neutral feedback
   - b_4 - evaluative feedback
   - b_5 - simultaneous talk
   - b_6 - nonverbal communication
3. Facet C: Focus
   - c_1 - person
   - c_2 - group
   - c_3 - subject matter
   - c_4 - environment
4. Facet D: Process
   - d_1 - information
   - d_2 - interrelating information
   - d_3 - generalizing or synthesizing
   - d_4 - affective expression
   - d_5 - directing psychomotor activity
5. Facet E: Function
   - e_1 - goal setting
   - e_2 - giving directions
   - e_3 - summarizing
   - e_4 - digression or disruption
   - e_5 - continuing the interaction

The primary advantage of using a facet structure system is that it permits ". . . formalization of both conceptual definition and of the connection between theoretical terminology and its observational implications" (Bar-On & Perlberg, 1973). In a facet system the categories of behavior to be coded are grouped into "dimensions" (facets) which include all of the logically possible events of interest in a teaching episode. The facet structure of the coding system used in the present study can be expressed in terms of a "mapping sentence" (Bar-On & Perlberg, 1973) as follows:



Each unit of communication or "coding unit" was characterized by a four digit number. A "coding unit" was defined as a communication originated by a single person, having a single focus, involving a single process, and serving a single function. The first digit was used to characterize both the originator (Facet A) and type of communication (Facet B). The second digit was used to describe the focus (Facet C) of the communication. The third digit was used to describe the process (Facet D) explicit or implicit in the communication. The fourth digit was used to describe the function (Facet E) of the communication.

The five mutually exclusive facets of communication were defined as follows:

Facet A: Originator

The originator was defined as the person sending the communication. The originator was either the teacher or a student.

Facet B: Type of Communication

Statement: A communication which gives information. Rhetorical questions were coded as statements.

Question: A communication which asks for information. Units within this category are most frequently in the grammatical form of questions, however, some solicitations occur in the form of statements with the tone of voice indicating that the statement is really a question. For example, a teacher might inquire as to whether or not a student enjoyed a recent trip by saying, "Did you enjoy your trip?" or "You enjoyed your trip.(?)"

Neutral Feedback: A response following and clearly related to the previous remark by another speaker. In this category the response is relatively noncommittal or repeats or paraphrases the preceding remark.

If the only response by the teacher to a student remark is the word "What?," then the unit is coded as neutral feedback.

Evaluative Feedback: A response immediately following and clearly related to the preceding remark by another speaker. This type of response indicates the correctness or appropriateness of the preceding remark. Examples are "Good," "That's a very interesting idea," "Good point," "No that's not right."

Simultaneous Talk: Frequently in the classroom interaction, two or more persons will talk at the same time. If it was possible to distinguish the words of a single speaker even though others are talking at the same time, then the communication of the single speaker was coded. If it is impossible to distinguish a single speaker, the interaction was coded as simultaneous talk.

Nonverbal Communication: Nonverbal behavior which is clearly responsive to the preceding communication and which occurred in the absence of verbal behavior. Behavior coded in this category included nodding in agreement, pointing out a particular direction, writing a student response on the board without verbal comment, or a show of hands in response to a teacher request. If verbal and nonverbal behavior occurred simultaneously, the verbal behavior alone was coded.

Facet C: Focus

The focus describes what the communication is about. The focus of any unit was described by one of the following categories.

Person: If the main focus of the communication was a particular person, either the speaker or another, then the focus was coded as "person." Examples include "I have been to England." and "My sister is in the third grade."

Group: If the communication was about the immediate social group, e.g., two or more people in the classroom group, then the focus was coded as "Group." Questions or statements which use the personal pronoun "you" but which are directed at more than one person, were coded as having a "group" focus. Examples of units coded in this category are "You're all very quiet today." and "How many of you have been to Europe?."

Subject Matter: If the communication was related to the subject matter of the lesson, the focus was coded "subject matter." Examples include "How do you think the average worker in the aluminum plant feels about Banbury?" and "If you were walking down the streets of Banbury, what would you see?"

Environment: If the communication was about the physical setting or objects in the room, the focus was coded as "environment."

Facet D: Process

Process refers to the affective, cognitive, or psychomotor process dealt with in the communication. As a general rule, the process of the communication should be clearly related to the focus of the communication. For example, in the statement, "I want you to think about Roussillon," the process required is cognitive (i.e., "think") rather than emotional (i.e., "want") because the focus of the communication is "subject matter."

Information: The cognitive processes at this level are remembering, recalling, identifying, discriminating, enumerating, describing, and translating information from one medium to another (e.g., written to spoken, iconic to symbolic). At this level, the information is not manipulated, interrelated or transformed in any way, but is used as given. Examples are "What is the climate like in Roussillon?" and "Most people in Roussillon are farmers."

Interrelating Information: The cognitive processes at this level are those which integrate or interrelate pieces of information in order to compare or contrast, to draw cause-and-effect inferences, to interpret data, to apply what is given or what is general knowledge to a problem-solving situation, or to form concepts. Examples are "How does Roussillon differ from Palo Alto?" and "Joining the cooperative made it possible for farmers in Roussillon to have modern machinery."

Generalizing or Synthesizing: This is the level at which concepts and facts are generalized and synthesized into a larger theoretical structure. Included are the statement of principles, laws, or relationships which cover all cases in a class or which bring together ideas or generalizations which have not been brought together in this manner before. Other cognitive activities at this level include hypothesizing and developing criteria. It is assumed that the thinker has taken information given or remembered and transformed it to the point that the theoretical structure becomes the center of attention, rather than the original facts. An example is "If most French are conformists and most Americans are nonconformists, then the people in Roussillon would look on most of us as hippies."

Affective Expression: Included are communications which express feelings, opinions, or prejudices (i.e., judgments whose source and justification are personal or subjective rather than objective or empirically derived). Remarks such as "I enjoyed it." or "Would you like to live in Roussillon?" were coded as "affective." Also included were communications which involved empathy or the ability to express how another person feels. An example is "How do you think the average worker in the aluminum plant feels about the plant manager?"

Directing Psychomotor Activity: Communications which deal with classroom activity or psychomotor actions were coded in this category. Examples are "Now we are going to do role-playing," "Please open your books," and "Why aren't you paying attention?"

Facet E: Function

The function of the communication was coded in one of the following categories:

Goal Setting: This category includes remarks which describe the expected outcomes of a classroom activity, such as the product, the behavioral objective, the standard of achievement or proficiency, or the criteria which will be used to evaluate outcomes. Also included are remarks which set the context of the lesson in terms of future instructional activities, determine the substantive focus of the activity being structured, and specify the procedures that will be followed. For example, "Today, boys and girls, we're going to learn about a town in France." and "I want you to remember these words."

Giving Directions: These are remarks which explicitly direct and structure behavior while classroom activity is going on. They are distinguished from goal setting by the immediacy of the response required. Included are remarks which control the immediate use of instructional materials or maintain the social or physical environment of the classroom. For example, "Let's take one at a time." and "We're not going to criticize what other people say."

Summarizing: This category includes remarks which review, recount, or describe two or more previously mentioned ideas or activities in order to clarify what has been discussed, to refresh the memory of those involved,

or to describe preceding discussions. For example, "Now John mentioned asparagus and Mary mentioned grapes." and "We've discussed the geography, economics, and history of Roussillon."

Digression or Disruption: This category includes any remark which is clearly unrelated to the ongoing discussion such as a comment about being hungry in the middle of a discussion of economics. Any remark which is even remotely related to the ongoing interaction is not coded in this category. Also included in this category are remarks clearly directed at some purpose other than continuing the ongoing discussion and communications which interrupt the speaker. Remarks which are solely directed at disrupting the class, upsetting the teacher, drawing attention to the speaker, or being funny, are coded in this category. Nonverbal responses such as making faces or gestures, hitting or threatening to hit another, batting the microphones, jumping out of one's seat, pounding on the table are also coded in this category.

Continuing the Interaction: Communications are coded in this category if the function of the communication was not judged to be goal setting, giving directions, summarizing, or digression or disruption.

Coder Training

A four-step procedure was followed in training coders to use the interaction analysis system. First, coders read a coding manual containing definitions of the categories in the system and examples of communications within each category. Second, the coders completed several written exercies and criterion tests which involved categorizing single communications. Third, the coders practiced dividing typescripts of classroom interaction into coding units and categorizing the communications until they achieved

criterion. Fourth, the coders practiced coding sample videotapes and were required to code a criterion videotape.

Reliability of Coding

To determine reliability of the coding of teaching variables, each coder coded the same set of eight videotapes. Interrater agreement for the various teaching process variables was considered satisfactory for the purposes of this study, with coefficients ranging from .34 to .96. A generalizability study of the teaching process data (Peterson and Anton, 1975) indicated that the components of variance due to coder were very small or zero in most cases.

Definition of Teaching Process Variables

For the purposes of this study, teaching process was described by reducing the interaction analysis data to 20 variables, defined in Table 7. These teaching process variables showed distributions would permit parametric statistical analysis. For the 19 ratio variables it was necessary to generate arcsin transformations to normalize their distributions before entering these variables into the analyses. These variables are used below to describe a typical teaching day, change in teaching process with teacher practice, and the relationships between teaching process and student posttest variables.

TABLE 7

Teaching Process Variables

Number	Name	Type	Definition
1	Teacher Statements	Ratio	Proportion of Communications which are Teacher Statements Per Day
2	Teacher Questions	Ratio	Proportion of Communications which are Teacher Questions Per Day
3	Teacher Feedback	Ratio	Proportion of Communications which are Neutral Feedback Plus Evaluative Feedback Per Day
4	Teacher Talk	Ratio	Proportion of Communications which are Teacher Statements Plus Teacher Questions Plus Teacher Feedback Per Day
5	Student Statements	Ratio	Proportion of Communications which are Student Statements Per Day
6	Student Questions	Ratio	Proportion of Communications which are Student Questions Per Day
7	Student Talk	Ratio	Proportion of Communications which are Student Statements Plus Student Questions Per Day
8	Person Focus	Ratio	Proportion of Communications which are Person Focus Moves Per Day
9	Group Focus	Ratio	Proportion of Communications which are Group Focus Moves Per Day
10	Subject Matter Focus	Ratio	Proportion of Communications which are Subject Matter Moves Per Day
11	Environment Focus	Ratio	Proportion of Communications which are Environment Focus Moves Per Day
12	Lower Order Cognitive Process	Ratio	Proportion of Communications which are Information Moves Per Day
13	Higher Order Cognitive Process	Ratio	Proportion of Communications which are Interrelating Information Plus Generalizing or Synthesizing Moves Per Day
14	Activity Structuring	Ratio	Proportion of Communications which are Directing Psychomotor Activity Moves Per Day

TABLE 7 (continued)

Number	Name	Type	Definition
15	Affective Process	Ratio	Proportion of Communications which are Affective Expression Moves Per Day
16	Goal Setting	Ratio	Proportion of Communications which are Goal Setting Moves Per Day
17	Implementation	Ratio	Proportion of Communications which are Giving Directions Moves Per Day
18	Summarizing	Ratio	Proportion of Communications which are Summarizing Moves Per Day
19	Digression or Disruption	Ratio	Proportion of Communications which are Digression or Disruption Moves Per Day
20	Pace	Frequency	Total Number of All Types of Moves Per Day

Table 8 shows the intercorrelations of the 20 teaching process variables used in the analyses. The majority of the high positive correlations are part-whole correlations. For example, Teacher Talk includes Teacher Statements, Teacher Questions, and Teacher Feedback. The high negative correlations are largely between variables within the same Facet and reflect the mutual exclusivity of the variables within a Facet. For example, when a large number of Teacher Statements were made, the proportion of Student Statements made becomes necessarily small ($r = -.68$). Other correlations of interest are discussed below.

Table 8

Intercorrelations of Teaching Process Variables
(N = 36)

Teaching Process Variables	Tchr Stmts	Tchr Quans	Tchr Fdbk	Tchr Talk	Studt Stmts	Studt Quans	Studt Talk	Persn Focus	Group Focus	Subj Mat Focus	Envt Focus	LowOr Cogn Proc	HghOr Cogn Proc	Actv Struct	Affec Proc	Goal Sete	Inptn	Summz	Digrsn/ Disrpt	Pace
1. Teacher Statements		-.14	-.01	.68**	-.68**	-.30*	-.68**	.13	.17	-.08	.12	.15	-.34*	.18	.04	.33*	.33*	.08	-.11	-.18
2. Teacher Questions			.60**	.59**	-.40**	-.58**	-.51**	-.37**	-.28*	.36**	-.10	.10	.26	-.30*	-.25	.03	-.25	.45**	-.53**	-.25
3. Teacher Feedback				.60**	-.50**	-.39**	-.54**	-.03	.04	-.08	-.13	.10	.09	-.42**	-.20	-.02	-.19	.48**	-.61**	-.39**
4. Teacher Talk					-.88**	-.64**	-.95**	-.10	.00	.10	.00	.20	-.11	-.14	-.16	.26	.06	.44**	-.47**	-.38**
5. Student Statements						.34*	.96**	-.01	-.16	.11	-.06	-.17	.32*	-.14	.25	-.38**	-.26	-.44**	.38**	.33*
6. Student Questions							.58**	.13	.07	-.19	.21	.04	-.22	.29*	-.13	.03	.18	-.15	.63**	.49**
7. Student Talk								.03	-.11	.04	.01	-.13	.21	-.04	.18	-.33*	-.18	-.42**	.50**	.43**
8. Person Focus									.44**	-.91**	.14	.08	-.39**	.06	.15	.06	-.15	-.20	.29*	.02
9. Group Focus										-.65**	-.12	-.40**	.00	.31*	.27*	-.03	.33*	-.19	-.06	-.30*
10. Subject Matter Focus											-.22	.15	.30*	-.22	-.19	-.10	-.01	.13	-.14	.14
11. Environment Focus												-.19	.06	.21	.20	.35*	.07	.14	.27*	.06
12. Lower Ord. Cog. Process													-.67**	-.40**	-.72**	.13	-.37**	.33*	-.02	.49**
13. Higher Ord. Cog. Process														-.18	.40**	-.35*	-.01	-.01	-.07	-.39**
14. Activity Structuring															.02	.23	.69**	-.25	.11	.10
15. Affective Process																-.06	.05	-.49**	.16	-.40**
16. Goal Setting																	.13	.11	-.01	-.10
17. Implementation																		-.08	.00	-.12
18. Summarizing																			-.16	-.25
19. Digression/Disruption																				.22
20. Pace																				

*p ≤ .05
**p ≤ .01

Teaching Process in General

Given the constraints of the design of this study on time, materials, group size, classroom setting, and student learning objectives, what kind of teaching went on? Table 9 shows proportions of teaching process variables for all days combined and for each day separately. Within each facet, the proportions do not total to 100% because some variables (e.g., Teacher Talk) are composites of other variables and because some low-frequency variables (e.g., Nonverbal) have been omitted. The proportions of teaching process variables for all days combined represents an average day or a typical day. The dialogue between teachers and students was rather evenly balanced, Teacher Talk accounting for 48% of the coded moves and Student Talk accounting for 45%. Teachers tended to make a relatively large proportion of statements and teachers asked questions of students in 16% of the moves. Students asked very few questions (6% of all moves) and the preponderance of student talk was due to Student Statements (39%), many of which were in response to Teacher Questions.

As to the focus of the teaching, it was, on the average, very task oriented, with 58% of the moves focused on Subject Matter. The next largest category under focus was Person (20%) with relatively few moves coded as focused on Group or Environment.

In the process facet of the coding system the largest proportion of moves was coded as Lower Order Cognitive Process. That is, the teachers and students tended to talk about the subject matter at the factual or recall level rather than at higher cognitive levels. On the average, a relatively small proportion (14%) of teaching process moves had to do with Affective Process.

Table 9

Mean Proportions of Teaching Process Variables for All Days Combined and for Each Day Separately

Facet	Variable	All Days Combined	Day 1	Day 2	Day 3
Facet A/B: Originator/Type Communication	Teacher Talk	.48	.47	.48	.48
	Student Talk	.45	.46	.44	.45
	Teacher Statements	.26	.25	.26	.26
	Teacher Questions	.16	.16	.16	.16
	Teacher Feedback	.06	.06	.06	.06
	Student Statements	.39	.40	.38	.39
	Student Questions	.06	.06	.06	.06
Facet C: Focus	Person	.20	.19	.22	.20
	Group	.06	.06	.06	.06
	Subject Matter	.58	.60	.55	.58
	Environment	.03	.02	.02	.03
Facet D: Process	Lower Order Cognitive	.51	.53	.52	.49
	Higher Order Cognitive	.11	.12	.10	.10
	Affective	.14	.13	.14	.15
	Activity	.11	.10	.09	.13
Facet E: Function	Goals	.01	.01	.01	.01
	Implementation	.05	.05	.04	.05
	Summary	.00	.00	.00	.00
	Digression/Disruption	.02	.02	.02	.01
	Continue Ongoing Interaction	.92	.92	.93	.93

In the function facet of the coding system the vast majority of teaching process moves function to sustain the ongoing discussion rather than serve one of the functions implied by the labels of the other four categories in this facet. Goal Setting occurred only 1% of the time and Summarizing not at all. On the average, the classes were well-behaved and cooperative; only 2% of the teaching process moves were coded as Digression or Disruption.

The teaching process data indicate that, on the average, the kind of teaching that went on was a form of the recitation strategy in which teachers made statements and asked questions mainly about the subject matter and mainly at the lower-order cognitive level. The students' role was mainly to answer teacher questions about the subject matter. The classes were orderly, and some attention was paid to affective processes.

Teacher Practice and Teaching Process Variables

When the teaching process variables are examined separately for Days 1, 2, and 3 (Table 9), we see much the same profile as was discussed above. That is, on the average, teaching process as described by these variables was very similar on Days 1, 2, and 3. Tables 10-13 show the proportions of the teaching process variables for each teacher separately. Even at the individual level, the similarity of the distributions of these variables is remarkable. That is, the teachers tended to teach very much like one another.

For the Facet A/B variables (Table 10) half of the teachers (Teachers 1, 6, 8, 10, 11, and 12) had a larger proportion of Student Talk than Teacher Talk. But even in these cases, Teacher Talk never

dropped below 41%. The largest difference is that between Teacher Talk and Student Talk for Teacher 7: 62% to 33%. All teachers had higher proportions of Teacher Statements than Teacher Questions or Teacher Feedback. Student Statements accounted for a considerably larger amount of Student Talk than did Student Questions.

For the Facet C variables (Table 11), Subject Matter Focus had the highest proportion for every teacher, indicating highly task-oriented teaching. The proportions for Subject Matter Focus range from 70% to 44%, and this variable has a necessarily high negative correlation with Person Focus ($r = -.91$) inasmuch as extremely task oriented teachers must focus relatively little on themselves and their students, and vice versa, the two kinds of focus being almost completely mutually exclusive. This inverse relationship also appears, for the same kind of reason, between Subject Matter Focus and Group Focus ($r = -.65$). Environment Focus was a very low proportion variable for all teachers.

Table 12 shows proportions for Facet D teaching process variables. Lower-Order Cognitive Process had the highest proportion for all teachers. Teachers who had relatively low proportions for this variable (e.g., Teachers 4, 5, 8, and 9) tended to spend a relatively high proportion of their time on Higher-Order Cognitive Processes and on Affective Processes. Activity Structuring was generally the variable with the lowest proportion in this Facet (except for Teachers 2, 6, 7, and 11).

Table 13 shows that there were essentially no individual differences in Facet E variables because of the extremely low frequency with which they were coded. The vast majority of teaching process moves functioned to sustain the ongoing interaction. Practically no Goal Setting, Summary, or Implementation moves occurred. Digressive or Disruptive moves were also extremely rare.

Table 10

Mean Proportions of Teaching Process Variables
in Facet A/B (Originator/Type) for Each Teacher, Across Days

Teacher	Teacher Talk	Student Talk	Teacher Statements	Teacher Questions	Teacher Feedback	Student Statements	Student Qustions
1	.46	.49	.23	.18	.05	.43	.06
2	.48	.43	.29	.13	.06	.36	.06
3	.57	.39	.32	.16	.08	.34	.05
4	.50	.45	.21	.19	.10	.40	.06
5	.50	.43	.26	.19	.06	.39	.04
6	.41	.49	.19	.16	.06	.42	.07
7	.62	.33	.31	.21	.10	.28	.05
8	.42	.51	.20	.15	.07	.46	.04
9	.51	.41	.37	.11	.03	.35	.06
10	.42	.49	.24	.13	.05	.42	.06
11	.42	.51	.23	.16	.03	.44	.06
12	.43	.49	.24	.14	.05	.43	.06
Median	.47	.47	.24	.16	.06	.41	.06
Range	.21	.18	.18	.10	.07	.18	.03

Table 11

Mean Proportions of Teaching Process Variables in Facet C (Focus) for Each Teacher, Across Days

Teacher	Person Focus	Group Focus	Subject Matter Focus	Environment Focus
1	.18	.05	.66	.01
2	.23	.08	.52	.02
3	.28	.06	.47	.06
4	.15	.04	.64	.03
5	.18	.07	.60	.02
6	.15	.08	.59	.02
7	.15	.05	.64	.01
8	.22	.09	.54	.01
9	.23	.10	.55	.02
10	.32	.06	.44	.04
11	.13	.02	.70	.04
12	.22	.05	.58	.03
Median	.20	.06	.59	.02
Range	.19	.08	.26	.05

Table 12

Mean Proportions of Teaching Process Variables in Facet D (Process) for Each Teacher, Across Days

Teacher	Lower Order Cognitive	Higher Order Cognitive	Affective	Activity
1	.66	.08	.10	.06
2	.54	.04	.10	.16
3	.52	.10	.19	.07
4	.44	.16	.15	.09
5	.40	.16	.19	.11
6	.46	.14	.12	.13
7	.69	.04	.04	.08
8	.44	.19	.18	.05
9	.43	.09	.20	.17
10	.53	.05	.14	.14
11	.52	.14	.10	.13
12	.50	.11	.17	.09
Median	.51	.10	.15	.10
Range	.29	.15	.16	.12

Table 13

Mean Proportions of Teaching Process Variables in Facet E (Function) for Each Teacher, Across Days

Teacher	Goal Setting	Implementation	Summary	Digression/ Disruption
1	.00	.03	.00	.01
2	.01	.07	.00	.01
3	.01	.03	.00	.02
4	.00	.05	.00	.02
5	.01	.05	.00	.01
6	.01	.05	.00	.01
7	.01	.04	.01	.00
8	.00	.03	.00	.02
9	.01	.08	.00	.03
10	.02	.04	.00	.03
11	.01	.05	.00	.03
12	.01	.04	.00	.02
Median	.01	.05	.00	.02
Range	.02	.05	.01	.03

Teaching Process Variables and Student Posttest Variables

Adjusted Recall

Table 14 shows the correlations between teaching process variables and student posttest variables. For the Adjusted Recall measure only one of the Facet A/B process variables shows a significant correlation. This negative correlation between Student Questions and Adjusted Recall ($r = -.48$) may indicate that numerous student questions reflect lack of clarity in the presentations of some teachers. The substantial correlation between Student Questions and Irrelevant/Disruptive Moves ($r = .62$) suggests that a substantial proportion of student questions were not judged to be directly relevant to the topic at hand. Hence, the negative correlation with Adjusted Recall. The four teacher variables in Facet A/B correlate positively with Adjusted Recall, with the correlation for Teacher Feedback ($r = .23$) approaching significance. The three student variables in Facet A/B correlate negatively or close to zero with Adjusted Recall.

All of the Facet C teaching process variables, Person Focus, Group Focus, and Environment Focus correlate negatively with Adjusted Recall, but Environment Focus had the only significant correlation of the three ($r = -.36$). It may be that those teachers and students who were most concerned with features of the environment, such as the video cameras, temperature of the room, or novelty of the setting, were more distracted and therefore less effective. Subject Matter Focus was positively correlated with Adjusted Recall, but not significantly.

Of the Facet D variables, Lower Order Cognitive Process was positively, but only slightly ($r = .17$) correlated with Adjusted Recall. This low correlation is somewhat surprising, since the items on the

Table 14

Correlations Between Teaching Process Variables and Student Posttest Variables

(N = 36: 12 teachers, each with 3 classes)

	Student Posttests				
Teaching Process Variables	Adjusted Recall[a]	Essay Concrete	Essay Abstract	Attitude Toward Situation	Attitude Toward Self
Facet A/B					
Teacher Talk	.17	.02	-.07	-.20	-.51**
Student Talk	-.12	-.02	.10	.18	.45**
Teacher Statements	.04	-.12	-.13	-.15	-.21
Teacher Questions	.15	.11	.13	-.07	-.44**
Teacher Feedback	.23	.24	-.02	-.05	-.31*
Student Statements	.02	.01	.16	.29*	.48**
Student Questions	-.48**	-.11	-.16	-.24	.12
Facet C					
Person Focus	-.01	.10	-.12	.15	.26
Group Focus	-.18	-.17	.00	-.04	.06
Subject Matter Focus	.12	-.06	.11	-.07	-.23
Environment Focus	-.36*	.06	-.02	-.17	-.02
Facet D					
Lower Order Cognitive Process	.17	.27*	-.24	.04	-.02
Higher Order Cognitive Process	-.01	-.23	.26	-.02	-.14
Affective Process	.01	-.15	.40**	.16	.27*
Activity Structuring	-.35*	-.23	-.12	-.24	-.09
Facet E					
Goal Setting	-.29*	-.09	-.06	-.26	-.20
Implementation	-.27*	-.16	-.23	-.28*	-.15
Summary	-.06	.02	-.21	-.38**	-.54**
Digression/Disruption	-.27*	-.20	-.13	-.27*	.11
Pace	-.05	.05	-.17	.13	.21

[a]Recall scores adjusted for student vocabulary and necessary arithmetic operations scores.

*$p \leq .05$

**$p \leq .01$

recall measure were designed to require the students to use lower order cognitive processes. Higher Order Cognitive Process and Affective Process were uncorrelated with Adjusted Recall. Activity Structuring was significantly negatively correlated (r = -.35) with Adjusted Recall, suggesting that the more time spent "getting organized" for learning activities the less learning went on.

All of the Facet E teaching process variables correlate negatively with Adjusted Recall. The Facet E variables are extremely low frequency variables with small variances. Moves which were not coded in one of the four categories of Facet E were moves which function to sustain the ongoing interaction. Thus, it is not surprising that moves which interrupted the ongoing discussion related negatively to Adjusted Recall. Pace was uncorrelated with Adjusted Recall.

Essay Concrete

For Essay Concrete score, the pattern of correlations with teaching process variables is similar to the pattern discussed above for Adjusted Recall. For the Facet A/B variables, only Teacher Feedback approaches significance. Teacher Statements, Students Questions, and Student Talk are negatively correlated with Essay Concrete scores, but not significantly so.

None of the Facet C teaching process variables correlated substantially with Essay Concrete score. As was the case with Adjusted Recall, Group Focus correlated negatively with Essay Concrete, but Environment Focus did not.

Among the Facet D variables, Lower Order Cognitive Process correlated positively and significantly (r = .27) with Essay Concrete, while the other three variables in this Facet correlated negatively. The

scoring for the Essay Concrete measure involved counting the number of concrete themes or facts mentioned in the essay. It therefore follows that students who spent a relatively large proportion of time dealing with lower order facts about the subject matter would be better prepared to perform well on the concrete portion of the essay test than students who spent time on other processes such as Higher Order Cognitive Process, Affective Process, and Activity Structuring. The negative correlations between these last three variables and Essay Concrete bear this out.

None of the Facet E teaching process variables correlated significantly with Essay Concrete score. Digression/Disruption moves correlated negatively with Essay Concrete as would be expected. Again, Pace was uncorrelated with Essay Concrete.

Essay Abstract

With the Essay Abstract measure, the Facet A/B teaching process variable correlations were slight and nonsignificant. Student Statements correlated positively with Essay Abstract while Teacher Statements correlated negatively. Teacher Questions correlated positively with Essay Abstract while Student Questions correlated negatively.

The Facet C teaching process variables were not significantly correlated with Essay Abstract.

In Facet D, it is interesting to contrast the correlations of Lower Order Cognitive Process and Higher Order Cognitive Process with Essay Concrete and Essay Abstract respectively. Lower Order Cognitive Process was positively correlated with Essay Concrete and negatively correlated with Essay Abstract. Higher Order Cognitive Process is negatively correlated with Essay Concrete and positively correlated with Essay Abstract.

This pattern of correlations support both the higher order-lower order distinction in the teaching process variables and the concrete-abstract distinction on the essay measure. Affective Process had a significantly positive correlation ($r = .40$) with Essay Abstract.

Again, all of the Facet E teaching process variables correlated negatively with Essay Abstract, as did Pace.

Attitude Toward Situation

With Attitude Toward Situation, the four teacher variables in Facet A/B correlated negatively. Student Statements and Student Talk correlated positively with Attitude Toward Situation and Student Questions again correlated negatively. These data indicate that students rated the teaching situation favorably if they were allowed to talk but rated the situation less favorably when the student talk consisted of student questions, many of which, as discussed above, tended to be irrelevant or disruptive.

For the Facet C variables, Person Focus correlated positively with Attitude Toward Situation, and Group, Subject Matter, and Environment Focus correlated negatively. The negative correlation between Environment Focus and Attitude Toward Situation is consistent with the idea that teachers and students who spent relatively large proportions of time discussing features of the physical environment were most concerned with negative aspects of the environment, such as the presence of video cameras and the relative formality of the setting.

Of the Facet D teaching process variables, Affective Process had the largest positive correlation with Attitude Toward Situation, an affective measure. Activity Structuring was negatively correlated with Attitude Toward Situation, indicating that students rated the learning

less favorably when teachers spent relatively large proportions of time organizing and managing learning activities.

All of the Facet E teaching process variables correlated negatively with Attitude Toward Situation, indicating that students preferred teaching situations which had few interruptions or changes in direction.

Attitude Toward Self

With the Attitude Toward Self measure, all of the Facet A/B teacher variables correlated negatively and all of the student variables correlated positively. That is, students rated themselves more favorably in classes in which they were able to talk more, including making statements and asking questions. In classes in which teachers talked relatively more, including Teacher Statements, Teacher Questions, and Teacher Feedback, the students rated themselves less favorably.

Among the Facet C teaching process variables, Person Focus correlated positively with Attitude Toward Self, while the remaining three variables correlated negatively or not at all.

Similarly, in Facet D, Affective Process correlated positively with Attitude Toward Self while the remaining three variables correlated negatively.

In Facet E, Digressive/Disruptive Moves correlated slightly positively with Attitude Toward Self while the remaining variables in this Facet correlated negatively.

The general picture that emerges from these data is that, for the teachers in this study, a choice had to be made between effectiveness on the cognitive student posttest variables and effectiveness on the affective student posttest measures. Teacher Talk and Teacher Feedback, for example, were positively related to the cognitive meas-

ures but negatively related to the affective measures. The same tends to be true of Subject Matter Focus. Some variables such as Activity Structuring, Goal Setting, Implementation, Summarizing, and Digressive/ Disruptive Moves show consistent negative correlations with student posttest achievement. None of the teaching process variables show consistent positive correlations with all student posttest variables.

Stepwise Regression Analysis

A stepwise regression analysis was performed to predict the student Recall Posttest scores. This analysis represents an attempt to examine the relative effect different variables had in predicting student achievement on the Recall Posttest. Although 32 variables were entered into this analysis, only those that contributed 2 percent or more to the prediction of the dependent variable have been reported. The 32 variables included student characteristics and student aptitude test scores, teacher characteristics and teacher aptitude test scores, teacher practice (Day), and the 20 teaching process variables which describe teacher-student interaction.

Table 15 shows the regression variables predicting the Recall Posttest. Only 4 of the 32 variables considered contributed an increase in R^2 of 2 percent or more. The first two variables to enter were student aptitude scores. Student Vocabulary score accounted for 25 percent of the variance in Recall Posttest and student Necessary Arithmetic Operations score contributed an additional 7 percent to the prediction. Student Sex was the third variable, increasing R^2 by 3 percent. The positive sign of the final coefficient for this variable indicates that girls did better than boys on the Recall Posttest. The fourth variable to enter was Student Questions, one of the teaching process variables. The sign

Table 15

Regression Variables Predicting Recall Posttest[a]
(N = 288)

Variable	r	R	R^2	Increase in R^2	Sign of Final Coefficient
Student Vocabulary Score	.50	.50	.25	.25	+
Student Necessary Arithmetic Operations Score	.48	.57	.32	.07	+
Student Sex	.18	.59	.35	.03	+
Student Questions	-.14	.62	.38	.03	-

[a] In this Table, the sign of the final coefficient (positive or negative) is indicated in the right-hand column. A simple correlation between a single independent variable and the dependent variable is indicated by *r*. A multiple correlation between the entered independent variables and the dependent variable is indicated by *R*. The multiple correlation coefficient squared R^2 indicates the amount of variance accounted for in the dependent variable by the entered independent variables.

of the final coefficient for Student Questions was negative, indicating that classes where the proportion of student questions was relatively high students performed more poorly on the Recall Posttest than in classes in which the relative proportion of Students Questions was low. This may indicate that student questions indicate confusion on the part of the students, lack of clarity on the part of the teacher, or irrelevant digressions by students, all of which would tend to work against achievement on the Recall Posttest.

In general, the results of the stepwise multiple regression analysis are consistent with the other results discussed in this chapter. The two student aptitude variables (Vocabulary and Necessary Arithmetic Operations) are the only strong predictors of achievement on the Recall Posttest. Other student aptitudes, teacher characteristics and aptitudes, and teaching process variables do not discriminate between high and low scoring students on this dependent variable. Teacher practice (Day) also failed to predict Recall Posttest. In the early steps of the stepwise multiple regression, Day did have a significant F. But as other variables entered, the F for Day became insignificant.

Aptitude-Treatment-Interaction Analyses

An additional set of exploratory aptitude-treatment interaction analyses was performed on the data. Each student posttest variable was regressed on each student aptitude measure for each teacher and the control group. Students were pooled across days for each teacher so that N = 24 for each teacher. F tests for parallelism of regression lines were computed, comparing each teacher to the control group for every possible pair of aptitude and posttest variables. The results of these

analyses will be reported separately (Clark, Peterson, and Stayrook, in preparation). The most conspicuous aptitude-treatment-interaction occurred between student Vocabulary score and student Essay Abstract score. For the twelve teachers, the pooled slope equalled 0.019, while for the control group, the slope was 0.154. Figure 8 presents the Vocabulary-Essay Abstract aptitude-treatment-interaction in graphic form. Vocabulary score predicts Essay Abstract score for students in the control group who read the text material and were tested immediately thereafter. There is essentially no relationship between Vocabulary score and Essay Abstract score for students who read the text material and were then taught about the material for almost three hours and tested at the end of the day. A tentative explanation for this finding is that students with high verbal ability depended heavily on remembering information from their reading of the text, while students of low verbal ability depended heavily on information discussed in class. Thus, high verbal ability students in the control group performed better than high verbal ability students in the taught classes because of the shorter time between reading the text and the posttest for control group students. Low verbal ability students, on the other hand, derived relatively little information from simply reading the text, but performed at a higher level on Essay Abstract after both reading the text and being taught.

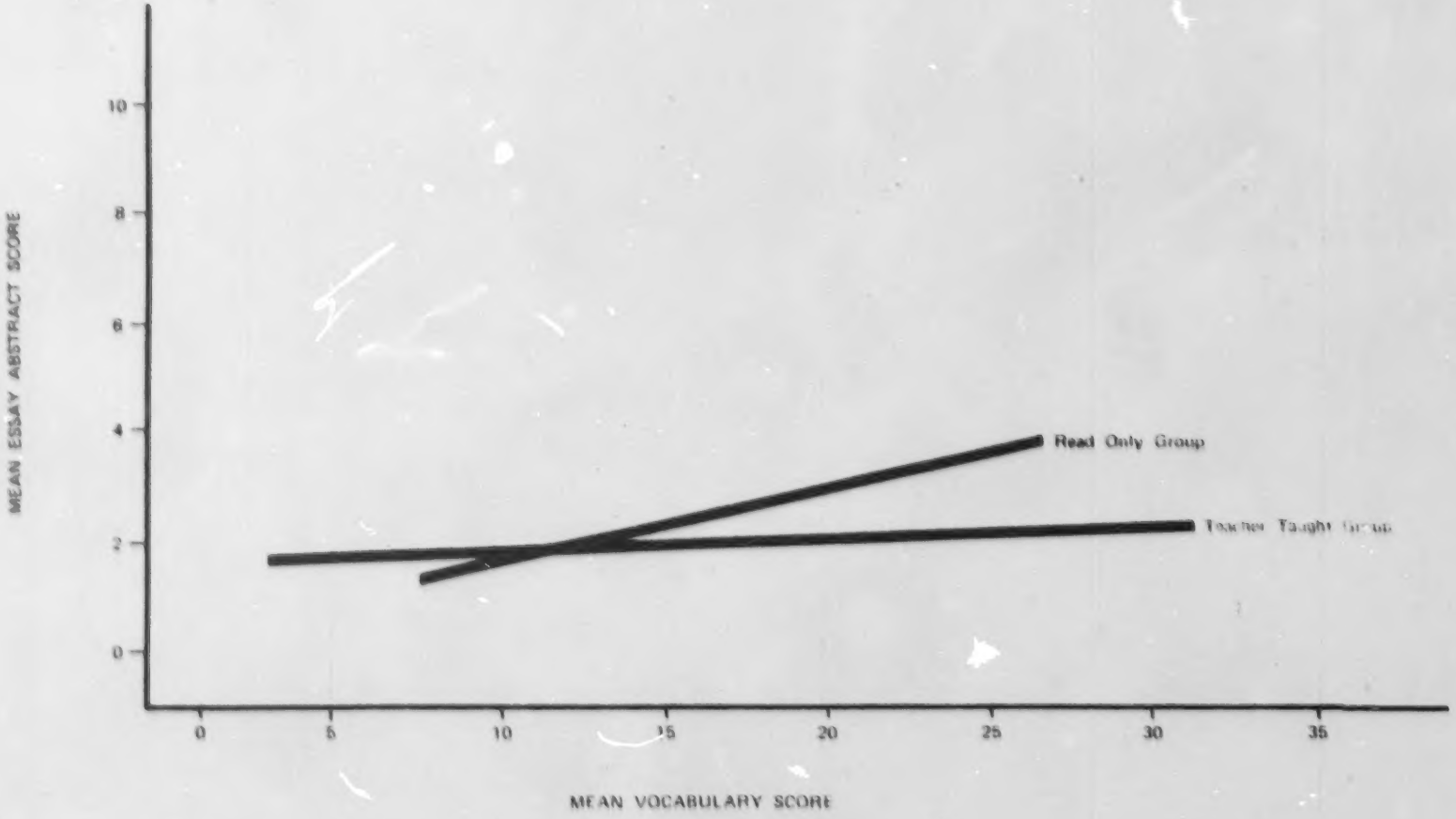


Fig. 8. Regression of student Essay Abstract scores on student Vocabulary scores showing aptitude treatment interaction for Teacher Taught and Read-Only groups.

CHAPTER V

SUMMARY AND INTERPRETATION

This research was designed to investigate changes in teaching process and student achievement as teachers repeatedly taught a short curriculum unit to three successive small groups of students. In this chapter, the investigation is summarized, the results are discussed, and educational implications are considered.

Summary

Method

Twelve experienced teachers were recruited: six males and six females. Each teacher taught the same social studies unit to three classes, each consisting of eight randomly assigned junior high school students. Teacher and student characteristics and aptitudes were measured before the teaching began by administering a general information questionnaire and four ability tests. These tests provided estimates of the subjects' verbal ability (Extended Range Vocabulary Test for teachers, and Vocabulary Test V-2 for students), reasoning ability (Necessary Arithmetic Operations Test), analytic ability (Hidden Figures Test), and conceptual level (Paragraph Completion Test).

Three days before teaching for the first time, each teacher was given two hours to read the text material and examine a set of color transparencies which were to be used in the teaching sessions. In addition, the teacher was given a list of objectives to be achieved by students. At the beginning of each teaching day, each teacher was given 90 minutes to plan the teaching session. The students were given one hour to read the text material and view the color transparencies before entering class.

To measure student cognitive achievement and attitudes after each teaching session, each student completed a multiple-choice Recall Test, an Essay Test, and an Attitude Inventory. Five student posttest variables were derived from these three instruments: (1) Adjusted Recall Test score (adjusted by analysis of covariance with student Vocabulary score and student Necessary Arithmetic Operations score as covariates), (2) Essay Concrete score (number of concrete themes on the Essay Test), (3) Essay Abstract score (number of abstract themes on the Essay Test), (4) Attitude Toward Situation score, and (5) Attitude Toward Self score.

All teaching sessions were videotaped. Trained observers viewed the videotapes and described teacher-student interaction using a facet-structure interaction analysis system especially created for this study. Twenty teaching process variables were defined and used to characterize teacher-student interaction.

Results

Recall Test. For the Recall Test, on the average, adjusted class means were relatively stable from Day 1 to Day 2 and then decreased significantly from Day 2 to Day 3. That is, the classes taught on the first two days tended to score highest and the classes taught on the third day tended to score lowest.

Essay Test. For Essay Test Concrete and Essay Test Abstract, two-way analysis of variance (Teacher X Day) indicated that these scores were stable across teacher and day. That is, neither amount of teacher practice nor the effects of particular teachers are reflected by these variables.

Attitude Inventory. Attitude Toward the Situation scores showed a mean increase from Day 1 to Day 2 and a decrease from Day 2 to Day 3. That is,

the classes taught on the teachers' second day of teaching expressed more positive attitudes toward the teaching situation than did the classes taught on a teacher's first and third days of teaching. Attitude Toward Self mean scores did not change significantly across days.

In all of these trends, there were notable differences among teachers. Some showed increasing trends with practice on some student posttest variables, suggesting positive "learning-to-teach." Others showed negative "learning-to-teach."

Teaching Process. The teaching process data indicate that, on the average, the kind of teaching that went on was a form of the recitation strategy. Teachers made statements and asked questions mainly about the subject matter and mainly at the lower order cognitive level. The students' role was mainly to answer teacher questions about the subject matter. The classes were orderly and some attention was paid to affective processes.

When the teaching process variables were examined separately for Days 1, 2, and 3, teaching process appeared to be very similar from day to day. Even at the individual teacher level, the similarity of the distributions of these variables was remarkable. That is, the teachers tended to teach very much like one another.

When teaching process data were correlated with student posttest variables, the general picture that emerged was that, for the teachers in this study, none of the teaching process variables showed consistent positive correlations with all student posttest variables. Teacher Talk and Teacher Feedback, for example, were positively related to the cognitive measures but negatively related to the attitude measures. The same tended

to be true of Subject Matter Focus. Some variables such as the Student Questions, Activity Structuring, Goal Setting, Implementation, Summarizing, and Digression/Disruption Moves tended to be consistently negatively correlated with student posttest achievement.

Conclusions

Conclusions to be drawn from this study are:

1. "Learning-to-teach" is not a general phenomenon across all teachers studied or across different kinds of student posttest variables. There are individual differences among teachers in the extent to which their students learn more or less with teacher practice. Relatively few teachers show marked increases in student learning with practice.
2. Overall, teachers decreased in their production of student recall and concrete theme achievement but remained stable in their production of abstract themes in student essays. If teaching tends to become less effective across practice on the same unit, it is not clear that conventional skill training can remedy this. Perhaps training can be devised to focus on eliminating negative teacher behavior that appears with practice, but this is a question for future work.
3. Some teacher and student verbal behavior variables are related to student achievement and attitudes. Formal experiments will be required to test the direction of causality and validity of these correlations before implications for teacher training can be drawn with confidence.
4. Student attitudes vary with teacher practice, but in a nonlinear

fashion. While improvements in attitude were noted after a second teacher practice, continued practice produced a decline in student attitude, perhaps due to a teacher "let-down" effect in the last session.

5. The laboratory paradigm examined in this study appears to be sensitive to teacher change with practice and to the effects of teacher training as measured by student learning.

Why did the teachers in this study fail to show marked increases in student learning with practice? It was expected that as the teachers' familiarity with the content to be taught, the teaching situation, and the reactions of students increased, so would their effectiveness increase. Certainly the teachers did become more familiar with the content, teaching situation, and student reactions. But this was apparently insufficient for improving teaching effectiveness.

One of the most striking effects in these results is the decrease from Day 2 to Day 3 of student adjusted Recall Test scores (11 of 12 teachers) and student Attitude Toward Situation scores (8 of 12 teachers). A comparison of the teaching process variables for Days 2 and 3 indicated that, for the categories of teacher and student verbal behavior measured by the interaction analysis system, teaching on Day 2 was very similar to teaching on Day 3. The drop in Day 3 student posttest scores was probably due to qualitative differences in teacher-student interaction not measured by the interaction analysis system. Possibly the teachers were bored with the task and the curriculum and communicated their lack of enthusiasm to the students. Teacher preparation and planning may also have been more perfunctory on Day 3, leading to poorly organized teaching.

Another explanation for the results of this study is related to the

extent to which the Harlow learning-to-learn paradigm of the psychological laboratory can be effectively translated into a design for research on teaching. Learning-to-teach, as investigated in the study reported here, may be a very different process from the learning-to-learn phenomenon investigated by Harlow. Harlow used discrimination tasks of a relatively low order in his investigations of learning in rhesus monkeys and children. In the present study, the teachers were faced with a much more complex task, namely, the task of combining teaching skills within a particular strategy in such a way as to teach particular groups of students most effectively. Teaching does involve a number of discrimination tasks, for example, discrimination of important learner characteristics, of important facts, principles, and concepts imbedded in the subject matter, and of teaching skills and strategies likely to be useful in teaching the content. But teaching is more than the sum of a series of multiple discrimination tasks. Teaching is more akin to a higher level problem-solving task in which the teacher must make a series of decisions about how to behave, given a great deal of complex information about subject matter, students, and the learning situation.

A second difference between Harlow's work and this study has to do with feedback. In Harlow's studies, the subjects received immediate feedback after each very brief trial. In the present study, the teachers were not given any information about tested student achievement. It was assumed that the teachers would be receiving sufficient feedback from the interaction with their students to make judgments about the effectiveness of their teaching behavior. Further, it was assumed that the teachers would be able to use the feedback from their interaction with students to change their teaching behavior in ways which would improve their subsequent

effectiveness. From the data, it is unclear where this logic broke down in practice. It may be that explicit and accurate feedback about student achievement and attitudes would have helped the teachers to improve their effectiveness. On the other hand, teachers might not know how to use even explicit and accurate feedback in ways which would improve their performance. Thus, we do not know whether the absence of learning to teach in the results was due to inadequate feedback to the teachers or to the teachers' inability to capitalize on the information available to them.

The third area of contrast between the present study and Harlow's learning-to-learn experiments is in the extent to which successive trials for any given subject are comparable. In Harlow's work, each subject was interacting with a mechanism which operated according to a fixed and predetermined set of rules. In the learning-to-teach study, the curriculum, learning objectives, and size of group were held constant in each trial. But the teacher was interacting with different students in each trial--students who were not behaving in controlled or prespecified ways. It may be that experience with a particular student or group of students is not very useful in improving the effectiveness of interaction with a subsequent group of students. In other words, familiarity with the content to be taught, the teaching situation, etc., may contribute only a small part to the effectiveness with which a teacher interacts with a new group of students in a similar situation. This question could be investigated experimentally by having teachers teach the same students over a number of comparable curriculum units.

The present study and Harlow's both used highly controlled laboratory settings. Important variables such as time, materials, and environmental factors were controlled in both cases. Such a highly structured situation

severely restricted the freedom of action of the teachers. Limited time and materials and pre-specified objectives probably limited their freedom to experiment with different teaching approaches, thereby limiting their opportunity to learn-to-teach. Further, the "plan aloud" technique and the debriefing procedure used to study teacher decision making may have made the teachers unusually self-conscious of their teaching behavior and more consistent from day to day (i.e., less adaptive to classes 2 and 3) than they otherwise might have been. Thus, the demand characteristics of the learning-to-teach experiment may ironically have prevented the phenomenon from occurring.

Finally, the learning-to-teach study reported here involved only a small number of trials (3) for each teacher, whereas Harlow's studies employed hundreds of trials for each subject. It may be that the hypothesized effects of teacher practice as measured by student achievement do not appear until after much more practice than this experimental design allowed for. Or, it may be that student achievement (as measured by a Recall Test, Essay Test, and Attitude Inventory) is not the "place" to look for the effects of teacher practice.

In the face of evidence to the contrary, it is still possible to retain some optimism that situation-specific teacher practice can indeed help a teacher become more effective. The study reported here represents an early attempt at exploring and demonstrating the learning-to-teach phenomenon. At least three lessons have been learned from this study: 1) our conceptualization of what is learned by teachers as they gain experience must be broadened and clarified; 2) our methodology for measuring effects on students of such teacher learning must be improved; and 3) the usefulness of direct application of this paradigm from the psychological laboratory to a design for research on teaching must be reexamined.

Implications for Teacher Training

Because the teachers in this study were experienced teachers, implications for teacher training can be applied to in-service training. Practice, by itself, did not enable teachers to increase student achievement. This indicates that teachers might profit from a process that would enable them to observe more systematically the effects on students of their teaching--an in-service training program that helps teachers become researchers on their own teaching effectiveness. Such a program would capitalize on the fact that every day or hour of teaching is an opportunity for a teacher to try new combinations of teaching skills and strategies, observe the effects, and adjust instructional performance to suit the particular students, situation, and subject matter being dealt with. Improvements in teaching effectiveness will be achieved only after teachers themselves have access to a means of defining and solving instructional problems in terms of the uniqueness of the complex teaching situations they face alone.

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APPENDIX A

INFORMATION FOR TEACHERS

We are interested in how teachers teach and how students learn. We would like you to help us by teaching a social studies lesson to a group of junior high school students. Information about the content, the lesson, and the students is summarized below.

The Content

The topic of the social studies lesson will be a European town and its inhabitants. You will be given the curriculum material to read and use in planning the lesson. The curriculum includes maps and charts and text material on geography, economics, and the family. A wall map of the country will be provided in each classroom. You will not be allowed to bring other curriculum materials into the classroom.

You will have one hour to read through the content material and an additional two hours to plan the lesson.

The Lesson

You should feel free to organize and teach the lesson in whatever manner you wish. You will have three fifty-minute teaching sessions for the lesson. You should begin and conclude each session on your own initiative.

You will be given an opportunity to look at the teaching room before you teach. A table, chairs, and a blackboard will be provided in the room. All teaching sessions will be videotaped so there will also be two video cameras and several microphones in the room.

The Students

The students in your class will be eight junior high school student volunteers from local schools. The students will be given one hour to read the text material before class. They will not have access to the text during the teaching sessions. On the next page is a list of objectives we hope you will try to cover. We understand that your teaching style will lead you to emphasize some things more than others.

The Objectives

As a consequence of the lesson, each student should

- Be able to recall, comprehend and organize information about the town and the people described in the text material.
- Be able to summarize and extract the main ideas from the information presented about the town and the people.
- Be able to group the information and arrive at principles about the town and the people.
- Be able to apply the principles to new situations (i.e., new material about another town).
- Be able to predict consequences of social, economic, and physical changes in a community.
- Form a personal opinion based on the information presented and their own personal values.
- Feel good about the subject matter, the teacher, and him/herself.
- Feel comfortable expressing his/her ideas and feelings.
- Know that his/her feelings and ideas are accepted and valued.
- Know something about the teacher's and other students' personal thoughts and feelings.
- Feel a sense of cohesiveness with other students in the class.

At certain points during the study, we will be asking you to rate and describe your own teaching behavior in the sessions as a means of stimulating your own reflection on your teaching. We are also interested in finding out how students view teaching. Therefore, at certain times we will also be asking the students to give us their perceptions of your teaching on the same dimensions you will be evaluating. Summaries of your students' descriptions will be prepared, and feedback will be given to you at certain times during the study or after the study is completed. (These will be summaries only and in no way will identify individual students. These summaries will be seen only by you and the researchers and will be for your use only. No one else will see them.) We hope you will find this information useful to you in evaluating your teaching experiences here.

APPENDIX B

TEACHER INFORMATION QUESTIONNAIRE

Full Name _____

Home Address _____
(Street) (City & Zip)

Home Phone _____

Social Security Number _____

Academic Degree and Year _____

Number of years of teaching experience:

Full-Time _____

Substitute _____

Please list full-time teaching experience:

Grade level	Subject matter(s) taught	Date and duration
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

What grade level do you prefer to teach? _____

Indicate what specialized training you have had in the following areas:

Audio Visual:

Speech:

Curriculum:

Test Construction:

Do you use a lesson or unit plan? Yes_____ No_____

If so, in what form do you typically record your plan? _____

_____

How would you characterize your typical way of teaching? _____

_____

When you construct a test, what kinds of items do you use? _____

_____

_____

APPENDIX C

STUDENT INFORMATION QUESTIONNAIRE

YOUR NAME _____

AGE _____ GIRL _____ BOY _____

ADDRESS _____

_____

PHONE NUMBER _____

YOUR SCHOOL _____ GRADE _____

HAVE YOU EVER PARTICIPATED IN A TEACHING SESSION LIKE THIS BEFORE? (WITH A TEACHER TEACHING A SMALL GROUP OF STUDENTS IN FRONT OF A TV CAMERA)

YES _____ NO _____

APPENDIX D

NAME: _____
(Please print clearly)

DATE: _____

TEACHER: _____

On the following pages are some multiple choice questions about what you have learned today. For each question, circle the number (1, 2, 3, or 4) corresponding to what you think is the right answer. For example:

Roussillon is located in
1) England
2) Italy
3) France
4) Germany

Make your circle carefully, clearly marking just the one answer that you choose. If you want to change an answer, erase the old one as completely as possible.

If you really don't know an answer, don't just guess. Leave it blank. But, if you feel fairly certain about what you think is probably the correct answer, then mark that answer. You will have plenty of time, so try to answer as carefully as possible.

STOP--DO NOT TURN THE PAGE

1. The text says, "Most people get married in the church." It also says that "The bride and groom are usually married first by the mayor in a ceremony at Town Hall." Together, these two statements mean that

1) a church marriage is not also a legal marriage.
2) people like the mayor and the priest.
3) the powers of the church and the state are combined.
4) the priest can perform a legal marriage.

2. In Roussillon, people usually spend the evening with their families because

1) they don't have money to do anything else.
2) it is serieux to do so.
3) families are a center for one's life in Roussillon.
4) there is nothing else to do.

3. For thousands of years, wars have been fought in and around Roussillon. At the present time, residents of Roussillon seem to feel

1) helpless to protect themselves against more wars.
2) helpless to have any effect on governmental decisions.
3) more optimistic about life than in preceding years.
4) even more pessimistic than before, due to the effects of World War II.

4. People of Roussillon (we are told)

1) are superstitious about disease.
2) constantly complain about their health.
3) prefer traditional remedies over the doctor's remedies.
4) complain of a sick liver when they are un peu fatigue.

5. The people of Roussillon

1) used to have a market day by law.
2) have a market day on Sunday.
3) go to Apt for market day.
4) have a law against holding a market day in their town.

6. In Roussillon the houses

1) have large front yards.
2) have small front yards.
3) have no front yards.
4) have gardens instead of front yards.

7. The job of an ochre miner is

1) an easy job which pays little money.
2) a hard job which pays little money.
3) not an exceptionally hard or easy job.
4) a hard job which pays a lot of money.

8. Which of the following statements is true about the people who live in Roussillon?

1) Occupational differences between people are ignored.
2) People are very aware of occupational differences between people, but such differences have little effect on how people treat one another.
3) People are very aware of occupational differences between people, and such differences have a large effect on how people treat one another.
4) Farming is the most respected occupation.

9. In Roussillon, the money a person earns

1) is his income, to use as he pleases.
2) is controlled by the city council.
3) and the amount he has in the bank are both used to figure his benefit allowance.
4) is automatically placed in his bank account.

10. Who in Roussillon can actually pay cash for all the things he needs?

1) Some farmers.
2) The teacher.
3) The town clerk.
4) Some ochre miners.

11. The distance from Avignon to Roussillon is

1) 35 miles.
2) 4 miles.
3) traversed by a railway.
4) 39 miles.

12. In Roussillon, motor vehicles are

1) not used much in the town.
2) important for commercial transportation.
3) unimportant for social reasons.
4) maintained to look as nice as possible.

13. Frederic Mistral was a famous modern French poet who wrote his poems in Provencal, an old language that is still spoken around Roussillon. Why would children probably know some of Mistral's works?

1) Provencal is most easily learned by memorizing poetry.
2) Poetry is read at home in the evenings.
3) Their parents and other adults probably quote Mistral.
4) Mistral's name is confused with the mistral.

14. Buildings in and around Roussillon are

1) usually built of wood, which is cheaper than other building materials.
2) built with an extra-thick wall on one side, to keep out the wind.
3) often built using a wide variety of designs and materials.
4) stuccoed on the outside with a mixture that is red because of the ecology of the area.

15. Inheritance is

1) seldom of importance in Roussillon.
2) specified by law in Roussillon.
3) the cause of two families owning parts of the same house.
4) not a cause of many problems about ownership.

16. The salle is

1) a meal similar to supper.
2) the main room of a Roussillon home.
3) a statue and a small park dedicated to the memory of an heroic girl.
4) a small salt-shaker.

17. The stores in Roussillon

1) include the Apt, an apartment-like supermarket.
2) were six in number until after World War II.
3) are inadequate for fulfilling all the residents' needs.
4) are the only sources of produce.

18. The farmers of Roussillon have subsistence-farmed in the past. This means that they once

1) lived solely off the crops they produced.
2) depended on their farming profits to supply most of their food, clothing and other necessities.
3) were given their subsistence in exchange for farming the land owned by a person of royalty.
4) produced a single crop, which determined how much they would earn each season.

19. If a native of Roussillon remains living there, he usually works

1) doing what his friends do.
2) doing what his father does.
3) for the government.
4) doing what his family tells him to do.

20. Since many people in Roussillon need to spend more money than they make, they

1) often have several jobs.
2) often trade rather than use money.
3) are being taken care of by the government.
4) are raising the amount they charge for their services.

21. The kind of art work emphasized in school in Roussillon is

1) the kind that most accurately represents the subject.
2) the use of different colors.
3) similar to the work of famous local artists.
4) sign painting and lettering.

22. Boules is

1) a kind of soup dish.
2) a game similar to our bowling.
3) the French word for "game."
4) an undergarment worn by French women.

23. The farmers did not want to plant fruit trees in Roussillon because

1) the climate was not suitable.
2) the trees take many years to grow.
3) people in Roussillon don't eat very much fruit.
4) the fruit would spoil before it got to market.

24. In Roussillon, a woman who is serieux

1) keeps her house neat and clean at all times.
2) only spends time on making her house neat and clean if visitors are coming.
3) decorates her house with curtains and paintings.
4) decorates her house according to the latest fashions.

25. The cooperative

1) owns the land.
2) cultivates the crops.
3) pays the taxes.
4) distributes the farming profits.

26. Considering the way houses are arranged and furnished in Roussillon, the people there seem to be

1) rather concerned about their personal comfort.
2) not too concerned about their personal comfort.
3) especially concerned about the comfort of young children.
4) concerned about how their houses look.

27. In Roussillon, the interiors of most houses

1) are clean, simple, and rather basic.
2) are painted in a variety of colors.
3) are usually cluttered, since the houses are so small.
4) are usually cleaned once a month.

28. Why were there many empty houses for a long time in Roussillon?

1) The people who are from Roussillon are very independent, and prefer to live in a house that they have constructed for themselves.
2) The houses needed repairs, and no one wanted to repair them.
3) People died or moved away, and more people did not appear to replace them.
4) The houses were too expensive for local people to buy.

29. The fuel for stoves in Roussillon is

1) electricity.
2) gas.
3) coal.
4) wood.

30. When people in Roussillon need to do shopping, they

1) go to several different small shops for different items.
2) go to a "general" or "variety" store which carries almost everything.
3) must go to Apt to get anything other than very common items.
4) most go to the stalls on market day to get any unusual items.

31. The main industry in Roussillon has

1) changed many times.
2) changed only recently.
3) never been very profitable.
4) always been subsistence-farming.

32. The climate in Roussillon is cooler than the climate of the surrounding area. This is because Roussillon is

1) located in the hills.
2) surrounded by trees.
3) always facing away from the sun.
4) always windy.

33. A man who grinds wheat is called a

1) cobbler.
2) blacksmith.
3) miller.
4) grovener.

34. People in Roussillon do not like to borrow money because

1) they do not trust banks.
2) they feel it is important to be self-sufficient.
3) they know it would be difficult to pay it back.
4) they would be criticzed for spending more than they need to spend.

35. People in Roussillon have started to buy television sets on credit because

1) television shows now deal with issues of interest to the people.
2) the town began to use electricity.
3) people became more confident about the future.
4) the people who have started to move into Roussillon brought TV sets, and so the idea of owning a set became acceptable.

36. Ochre is a

1) green vegetable.
2) red dye used in making paint.
3) green dye used in making paint.
4) fertilizer for fruit trees.

37. In Roussillon, most of the people who worked with ochre came from

1) Algeria.
2) Roussillon.
3) Paris.
4) Avignon.

38. Farmers in Roussillon were afraid to plant fruit trees because:

1) They had many wars.
2) The trees will be killed by disease.
3) The land isn't good for fruit trees.
4) It is too cold to grow them there.

39. The people in Roussillon do not belong to many clubs because:

1) They aren't very sociable.
2) They can't get organized.
3) They like to be independent.
4) They can get together in other ways.

40. People in Roussillon got along better before World War II because:

1) People had to be sneaky during the war to get the things they needed.
2) Nicer people used to live in the town.
3) People did not travel much to other places.
4) There were more places to get together before the war.

41. Children are punished in school by:

1) being beaten with a stick.
2) being kept after school.
3) being shamed in front of the class and the town.
4) being sent home.

42. Women in Roussillon do not go to the cafe because:

1) They have too much housework to do.
2) Only men are allowed in the cafe.
3) They have to stay home with the children.
4) They don't like to sit around and gossip.

43. Hunters kill little birds near Roussillon

1) because there are too many of them.
2) because they like the sport.
3) because the birds bother the farmers.
4) because they like to eat them.

44. The farms near Roussillon are farmed by:

1) Large concerns from the cities.
2) Hired hands.
3) The farmer, his wife and children.
4) The cooperatives.

45. The most important meal in Roussillon is

1) the noon meal.
2) breakfast.
3) supper.
4) gouter.

46. The men who work in the ochre mines come from:

1) Roussillon.
2) The towns around Roussillon.
3) Nearby cities.
4) Algeria.

47. Why are stones put on the roof tiles in Roussillon?

1) To help direct the flow of rainwater off the roof.
2) To keep the wind from blowing the tiles away.
3) People like the way it looks.
4) They help keep the house cool in the summer.

48. The families in Roussillon usually stay in:

1) the living room because the TV is there.
2) the kitchen where the mother is.
3) their bedrooms so they can be alone.
4) the salle, because it is living room, dining room, and kitchen combined.

49. All the houses in Roussillon are filled because:

1) the population is constantly increasing.
2) people from the cities have bought the empty houses.
3) if a house is empty too long it gets run down.
4) people like to rent houses in Roussillon.

50. It takes the housewife in Roussillon a long time to shop for groceries because:

1) She has to travel a long way because there are no stores in Roussillon.
2) She visits with all her friends while shopping.
3) She gets her food from the farms.
4) Each shop sells only one or two items, so she has to go to several for food for dinner.

51. If people in Roussillon do not make enough money they

1) Take another job.
2) Write to the government for help.
3) Trade things they have for things they need.
4) Find jobs for their children.

52. The government of France is disliked in Roussillon because:

1) The government makes laws which make the people feel helpless.
2) It is too far away to understand the people's problems.
3) It makes people argue with one another.
4) They have no one to represent them in government.

53. When people are sick in Roussillon they say

1) They have a headache.
2) They feel terrible.
3) They are going to die.
4) They are "un peu fatigue."

54. People have their babies baptized in Roussillon because:

1) They are afraid they will die.
2) The children may want to get married in the church.
3) Everyone loves baptism.
4) They don't want the children to go to Hell.

55. To have a baby in Roussillon, the mother

1) Goes to the hospital in Apt.
2) Has the doctor come to the house.
3) Calls her mother to come and help.
4) Goes to the doctor's office.

56. In Roussillon, in times past, windmills were used by

1) cobblers.
2) blacksmiths.
3) millers.
4) groveners.

57. Until fairly recently, housewives in Roussillon washed dishes

1) upstairs in a sink in the hall.
2) downstairs in the kitchen.
3) outside the house.
4) in a nearby stream.

58. Most of the workers in Roussillon

1) are farmers who rent their land.
2) are farmers who own their land.
3) are miners.
4) work in small shops.

59. What kind of stove is most widely in use in Roussillon?

1) electric.
2) gas.
3) coal.
4) wood.

60. The doctor who visits Roussillon

1) works in the blacksmith shop in a nearby village on his days off, and can be telephoned there in emergencies.
2) treats patients twice a week at the hotel.
3) can only be reached by mail at his home postoffice.
4) knows people in Roussillon are poor so he doesn't charge much.

61. In Roussillon, in times past, windmills were used for:

1) grinding wheat.
2) pumping water.
3) generating electricity.
4) showing the direction and speed of the wind.

62. People of Roussillon belong to the Catholic religion and go to the Catholic church services

1) very infrequently.
2) on a few days besides feast days.
3) every Sunday.
4) daily.

63. Baptism probably has

1) a simple role in the lives of Roussillon residents.
2) little meaning for people of Roussillon.
3) much to do with French citizenship.
4) something to do with job discrimination.

APPENDIX E

_____
Name

Student Attitude Form

On this form there are many ideas students might have about a class like the one you were in today. Please read each one carefully and then pick the answer that shows best how you feel about today's class.

Then place an "X" in the space that best shows what you think about the statement.

For example:

1. Today's class was fun.

Strongly Agree	Agree	Don't Know	Disagree	Strongly Disagree

If you think that today's class was really a lot of fun, then put an "X" where it says "Strongly Agree," because you strongly agree with the statement. If you feel that today's class was no fun at all, then you would put an "X" where it says "Strongly Disagree," because you strongly disagree with the statement. If you think that today's class was kind of fun, then you would put an "X" in the place for "Agree," and if you think that today's class was not too much fun, then you would put an "X" in the place for "Disagree." If you just don't know whether you thought today's class was fun or not, you would put an "X" in the middle where it says "Don't Know," because you don't know how you feel about the statement.

2. What I learned about in class today was not interesting to me.

Strongly Agree	Agree	Don't Know	Disagree	Strongly Disagree

If you think that what you learned today was really not at all interesting to you, then put an "X" where it says "Strongly Agree," because you strongly agree with the statement. If you feel that what you learned about today really was interesting to you, then you would put an "X" where it says "Strongly Disagree," because you strongly disagree with the statement. If you feel that what you learned about today was not interesting, then you would put an "X" in the place for "Agree," and if you think that what you learned about today was sort of interesting, then you would put an "X" in the place for "Disagree." If you just don't know if you thought what you learned about today in class was interesting or not, then you would put an "X" in the middle where it says "Don't Know."

1. I think it is interesting to learn about other towns.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

2. I think I did well in the class today.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

3. The teacher helped me to feel what it would be like to live in the town I learned about today.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

4. I can think of some ways the teacher could have made today's class more interesting to me.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

5. I think the teacher gave too many long speeches.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

6. I didn't like this teacher as much as most teachers I've had.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

7. I felt like I didn't have much to say in class today.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

8. I usually feel more relaxed in school than I did during today's class.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

9. I would like to learn more about the town we talked about today.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

10. If I were to be in class again like the one today, I would like to have this same teacher.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

11. I wish that we had learned about another topic than the one we talked about.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

12. The topic we learned about today was more boring than most of those I learn about in school.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

13. It seemed like the teacher was really interested in the town we learned about today.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

14. It seemed like the teacher really cared about what the students said today.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

15. I think it would be exciting to learn more about towns like the ones we learned about today.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

16. In today's class sometimes I was too shy to give an idea or ask a question.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

17. I think it's important for students in a class to always say what they're thinking.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

18. I think the teacher helped me learn more than I would have learned by just reading about the town we talked about today.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

---

19. The town I learned about today was not at all interesting to me.

Strongly Agree Agree Don't Know Disagree Strongly Disagree

20. I liked this teacher more than most teachers I've had.

Strongly Agree	Agree	Don't Know	Disagree	Strongly Disagree

21. My friends probably wouldn't be very interested if I told them about the topic I learned about today.

Strongly Agree	Agree	Don't Know	Disagree	Strongly Disagree

APPENDIX F

ANALYSIS OF VARIANCE AND ANALYSIS OF COVARIANCE TABLES

TABLE F-1

ANALYSIS OF COVARIANCE ON STUDENT RECALL POSTTEST
(N = 288)

	Df	Mean Square	F
Covariate: Vocabulary	1	1643.30	39.81**
Covariate: Necessary Arithmetic Operations	1	1251.89	30.33**
Day	2	201.64	4.89**
Teacher	11	67.30	1.63
Day x Teacher	22	52.22	1.26
Residual	250	41.28	
Total	287	64.75	

** $p \leq .01$

TABLE F-2

ANALYSIS OF VARIANCE ON STUDENT POSTTESTS: ESSAY CONCRETE, ESSAY ABSTRACT, ATTITUDE TOWARD SITUATION, AND ATTITUDE TOWARD SELF

(N = 288 to 312)

	Essay Concrete			Essay Abstract			Attitude Toward Situation			Attitude Toward Self		
	Df	Mean Square	F	Df	Mean Square	F	Df	Mean Square	F	Df	Mean Square	F
Day	2	17.50	0.62	2	1.06	0.34	2	362.42	4.68*	2	12.35	1.88
Teacher	12	38.79	1.37	12	5.35	1.73	11	477.02	6.16**	11	21.76	3.22**
Day x Teacher	24	30.37	1.07	24	3.43	1.11	22	212.94	2.75**	22	10.74	1.59*
Residual	273	28.36		273	3.10		252	77.38		252	6.76	

* $p \leq .05$

** $p \leq .01$